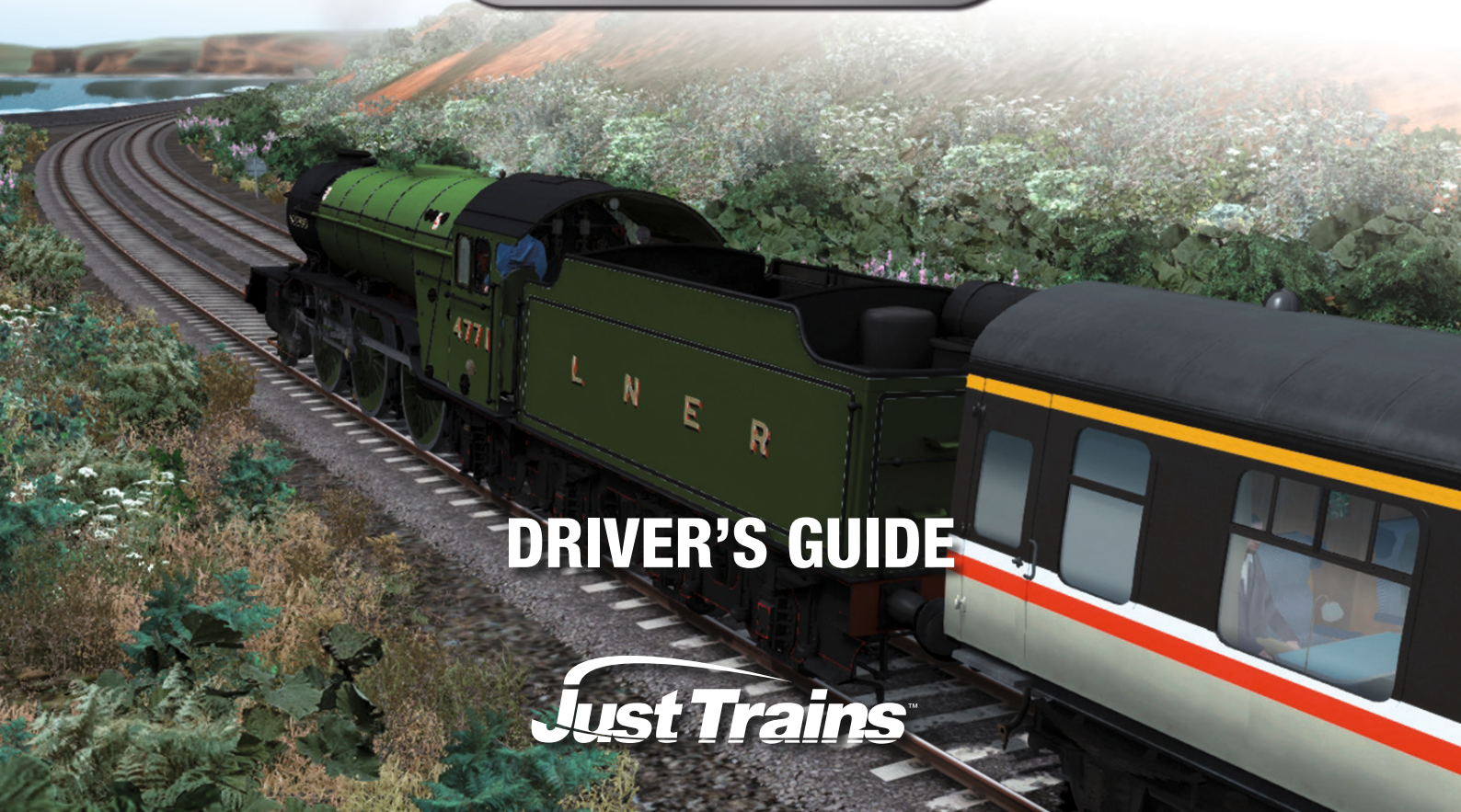
LNER V2

ADVANCED



DRIVER'S GUIDE

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Driver's Guide

Advanced steam locomotive expansion for Train Simulator

In memory of Ray Towell (1946-2016), former National Railway Museum Operations Manager, and perhaps best known as the man who looked after 4771 Green Arrow wherever she went, right up to the day she was withdrawn in 2008. RIP Matey.

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INTRODUCTION

The LNER Class V2 'Prairie' locomotive was arguably one of Sir Nigel Gresley's last great legacies before his untimely death in 1941. At one time 186 strong in number, they are considered by many to have been one of his most successful classes, thanks to their exploits both substituting for Gresley Pacific classes on express passenger trains and revolutionising the fast-fitted freight.

They are frequently (and somewhat controversially) described as "the locomotives that won the War" and there is no question that they proved themselves to be vital in the war effort, but perhaps a greater achievement was how, like the Black 5s of the LMS and the Halls and Granges of the GWR, they could do virtually anything that was required of them, be it hauling heavy freight or express passenger trains.

Outwardly the V2 Class locomotives look like a shorter version of the Gresley A3 Class with fewer and smaller wheels. It is true that they were based heavily on the larger Pacifics, with the boiler barrel being a shortened version of the A3 boiler and an identical firebox. The earlier proposed designs, however, showed some very different forms to the resulting locomotive; Gresley himself sketched his idea of the V2 as an improved Class K3 with a shared bogie between the loco and tender, followed by a works sketch showing a smaller 2-6-2 version of P2 Cock o' the North, changing again to a Prairie version of the A4 Class with the same Bugatti streamlining, before Doncaster finally settled on a much more conventional design. Even then the resulting locomotives were not the same as the final proposal, having longer boilers and the middle driving wheels moved forwards by three inches.

Evidence of this turbulent development cycle could still be seen in the final locomotives. For example, the V2s sported an A4-style 'V-wedge' streamlined cab instead of the flat facing cabs of the A3s. Whilst the streamlined wedge shape may have given a marginal reduction in drag coefficient (virtually all benefit would have been lost when the rest of the loco remained un-streamlined), the main reason for retaining this part of the design was because drivers on the A4s had reported that, compared to other classes such as the A3s, the angled front windows of the A4s did not reflect any glare from the glow of the fire that was impeding the driver's night vision. Large-diameter long-travel piston valves were also used, another design trait springing from experience with the earlier A4s.

At least one feature of the V2s was completely new to the LNER. When built, the V2s were all fitted with a single-cast 'monobloc', which combined the three cylinders, the steam pipes and smokebox saddle into one single casting, and had the benefit of saving weight and negating the need for tightly packed steam flanges between metal joints. The monobloc would, however, cause problems later on and was in fact the downfall of a large number of the class in the 1960s.

From the very beginning the V2s were well liked by the enginemen to whom they had been assigned, and although their primary duty was to power the fast fitted freight services, the LNER took great pride in these new locomotives, painting them in the prestige express passenger green livery and keeping them in immaculate condition. They soon spread across the vast London and North Eastern network, where they were put to work handling heavy goods and express passenger trains in equal measure and sometimes even covering for failed A3s and A4s.

They soon proved that not only could they take exceptionally heavy passenger trains of 20+ coaches, but they were also fast – really, really fast. Despite the smaller driving wheels, the large piston valves meant that the V2s were very free-steaming locomotives and were frequently caught reaching 90 MPH, meaning that they were usually only a few minutes behind time when replacing failed A4s on express passenger trains!

During the war both Doncaster and Darlington continued to build batches of V2s, along with the construction of aircraft, until the total number of loco's was brought up to 186. At least one more batch was ordered in 1942, but these loco's were effectively cancelled and replaced by the Thompson Pacific A2/1 Class, essentially a Pacific version of the V2 with three sets of Walschaerts valve gear and divided drive instead of Gresley's conjugated valve gear, which was giving the LNER nightmares at a time when maintenance standards were exceptionally low.

Despite the problems caused by the valve gear, the V2s were used on just about any type of train on the LNER as loco availability became increasingly desperate, and they were used on trains for which they were not designed, such as heavy loose-coupled coal trains. The three-cylinder arrangement with larger driving wheels could make starting these trains on gradients difficult, to say the least, and the brake force of the loco and tender alone was sometimes found to be inadequate. In one recorded incident a V2 was used to take 21 coaches from Newcastle to Peterborough, and then 26 coaches from Peterborough to London, but such events were simply expected as part of the harsh reality of the effects of war, and both men and engines coped.

After the war the V2s continued to do good work but they started to suffer seriously from derailing, due to a combination of the track-sensitive Gresley patented swing-link pony truck design and poor post-war track conditions. The problem was quickly resolved, however, by replacing the pony truck with a new design by Thompson, as fitted to his large L1 tank engines, which used a helical spring to control the side-to-side movement and provide a centring restoring force.

An even bigger problem arose when they were fitted with self-cleaning apparatus in the smokebox in the early days of British Railways. Self-cleaning apparatus is designed to keep the build-up of ash in the smokebox to a minimum by ejecting the ash and broken off coal particles up through the chimney, but it was not particularly efficient on any class of locomotive and, in the case of the V2, proved catastrophic when it came to the locomotive's ability to produce steam; this was because the solid plates between the boiler flue tubes and the blast-pipe and petticoat acted as a solid wall obstructing the draft through the firebed and boiler induced by the vacuum in the smokebox.

No. 60845 was sent to Swindon Test Plant in 1952 for a full examination of the locomotive's performance with and without self-cleaning apparatus, both at the test plant and out on the former Great Western Mainline.

As part of the tests and to cure the disastrous steaming ability of the locomotive when fitted with self-cleaning apparatus, Swindon designed a new convergent-divergent chimney liner (previously parallel) and a new blast-pipe, using their tried and tested formula that had been in use since Churchward was the CME of the Great Western. Not only did this eradicate the problem, but it was also a vast improvement on the original LNER design, increasing the previous maximum evaporation rate of 24,000 lb/hour without self-cleaning apparatus to 31,000 lb/hour with self-cleaning apparatus and the Swindon-designed chimney/blast-pipe combination. For some reason only about 20 other loco's were fitted with the new arrangement. The RCTS Green Book suggests that other loco's often had their self-cleaning apparatus removed by shed staff, despite being fitted with them every time they visited the Doncaster or Darlington works.

Trials and experiments were conducted throughout the 1950s in a bid to improve the overall performance of the class, including the fitting of double chimneys. The first double chimney was the exact same arrangement as on the Ivatt Rebuilt Scots of the former LMS, but this was found to make no significant difference to the steaming of the boiler in comparison to the original single chimney.

A revelation came when eight locomotives were fitted with Kylchap cowls, as fitted to the LNER Pacifics, and the locomotives were subsequently considered by their drivers to be the equal of the Pacific classes in terms of the speeds they could attain and the abilities of the boiler to produce steam. Indeed, at a time when the newly introduced diesel traction was proving to be woefully unreliable, an enginemen's representative told the Peterborough Local Department Committee, "It is double-blast V2s we need, not diesels!"

During the late 1950s an increasing number of V2s were beginning to suffer from cracked monobloc castings. Cracked cylinder blocks are not unheard of on any locomotive class after a long time in service, but the obvious problem with the monobloc was that if one part of the casting cracked, whether it was one of the three cylinders or an integrated steam pipe, then the entire unit needed to be replaced, which was both wasteful and expensive. So, rather than repairing the afflicted loco's by casting new monoblocs to replace the old, cracked castings, these loco's were fitted with separate cylinders, steam pipes and smokebox saddle, resulting in a drastic change to the front-end appearance. Viewed from the front, there was now very little to distinguish a V2 from a Gresley A3.

After 1962 any further locomotive that suffered a cracked monobloc was condemned to the scrapyard. The last V2 to be withdrawn for scrap was No. 60831 in 1966, which had the honour of being the last 'Big Gresley' steam loco to be withdrawn before the end of steam in 1968.

Miraculously, the pioneer loco, Green Arrow, was set aside in the early 1960s for a life in preservation and was stored at various sheds for safe keeping until a new permanent home could be found for it.

In 1971 the National Railway Museum agreed to take her in as part of the publicly-owned National Collection, and from that point on Bill Harvey and a team of enthusiasts restored her to working order at Norwich Crown Point depot in 1973, after which she became one of the elite stars of the mainline steam scene.

After three decades of almost continuous service across the mainline and on heritage railways, Green Arrow started to show that she too had succumbed to a cracked monobloc casting, and in 2008 was permanently retired for static display at the National Railway Museum. At a time when prices continue to rise, funding is being cut and the economic future remains uncertain, it is likely to be a long time before a brand new monobloc casting is forged and Green Arrow is flying along the mainline again, but we hope this will happen one day. In the meantime, this Just Trains LNER V2 collection is our love letter to one of the greatest British steam locomotive designs of all time, and we hope it will serve as a reminder of the awesomeness of Green Arrow and her long-lost sisters.

Resources

Locomotives of the LNER Part 6C: Tender Engines – Classes Q1 to Y10

The Railway Correspondence and Travel Society (RCTS, 1984)

The Power of The V2s

Gavin Morrison (Ian Allan Publishing Ltd, 2001)

The London & North Eastern Railway Encyclopedia: The Gresley V2 2-6-2 Prairie 'Green Arrow' Class

Richard Marsden, (online, 2001-2016)

LOCOMOTIVES AND TENDERS: LNER & BR ERA COLLECTION

The V2s wore many different liveries with a number of variants in their careers with the LNER and BR:

LNER/BR Doncaster Green

This is how a Doncaster-built locomotive would have been outshopped when new, or how even a Darlington-built locomotive would have been painted if Doncaster carried out a heavy overhaul, until the onset of war and austerity gave us plain black engines instead. The Doncaster green shade used in this Just Trains LNER V2 pack is a direct swab of the swatches that were used to paint 4771 Green Arrow into LNER Green livery in 2005/6, producing a highly accurate and beautiful recreation of what the Doncaster green loco's would have looked like in their LNER heyday.

Scenario editor list names:

- JT LNER V2 Doncaster Apple Green
- JT LNER V2 Tender 4200gal GS Type 2 Doncaster Apple Green
- JT LNER V2 Tender 4200gal GS Type 3 Doncaster Apple Green

LNER/BR Darlington Green

From the formation of the LNER and right up to the nationalisation of Britain's railways over 20 years later, tensions and rivalries between the head works at Doncaster (former GNR – Great Northern Railway) and the subordinate Darlington (former NER – North Eastern Railway) meant that Darlington mixed their own batches of green paint to create a shade very similar to the former NER Saxon green. It is in this shade of green, with green cylinders, that most V2s would have been seen, as Darlington built the overwhelming majority of the class. After much research we believe the Darlington green looked very similar to the representation shown on the Just Trains LNER V2. Which do you prefer – the lighter, yellower Doncaster, or the darker, bluer Darlington?

Scenario editor list names:

- JT LNER V2 Darlington Locomotive Green
- JT LNER V2 Tender 4200gal GS Type 2 Darlington Locomotive Green
- JT LNER V2 Tender 4200gal GS Type 3 Darlington Locomotive Green

LNER/BR Unlined Black

Plain black, the result of austerity during WWII and for many years afterwards, and an undisturbed presentation of the V2's clean lines and excellent proportions. Mmmm…

Scenario editor list names:

- JT LNER V2 Unlined Black
- JT LNER V2 Tender 4200gal GS Type 2 Unlined Black
- JT LNER V2 Tender 4200gal GS Type 3 Unlined Black

BR Lined Black

Some of LNER's finest found themselves effectively wearing LNWR lined black livery, the LNWR being a major constituent of LNER's rival, the London Midland and Scottish Railway! As if BR wasn't being cruel enough to the LNER diehard as it was…

Scenario editor list names:

- JT LNER V2 BR Lined Black
- JT LNER V2 Tender 4200gal GS Type 2 BR Lined Black
- JT LNER V2 Tender 4200gal GS Type 3 BR Lined Black

BR Lined Green

…and they then started to paint them in former Great Western colours! Gresley must have turned in his grave! Still, at least the Deep Bronze green with orange and black lining suited the V2s beautifully.

Scenario editor list names:

- JT LNER V2 BR Lined Green
- JT LNER V2 Kylchap Double Chimney BR Lined Green
- JT LNER V2 Tender 4200gal GS Type 2 BR Lined Green
- JT LNER V2 Tender 4200gal GS Type 3 BR Lined Green

LOCOMOTIVES AND TENDERS: PRESERVATION COLLECTION

Everyone's favourite preserved and former mainline-working steam loco (according to The Bash Mash), 4771 Green Arrow has worn two former LNER and BR liveries in her preservation career. So we offer you three versions. Eh? How does two make three? Because here at Just Trains we're so dedicated to detail that we decided the small differences between the loco when she was painted LNER green in the 1970s and 1980s and when she returned to LNER green as she is currently warranted separate models packed with those separate details. You can thank us later, after you've taken them all out for a spin!

LNER Doncaster Green

Repainted back into her original livery by Doncaster Works in the 1960s, Green Arrow wore this livery throughout her assimilation into the National Railway Museum collection in 1971, her return to steam in 1972, and while hauling mainline specials, partaking in special events and visiting heritage railways throughout the 70s, 80s and early 90s. This livery features British Rail's earlier white and red OHLE warning stickers.

Scenario editor list names:

- JT LNER V2 No. 4771 Doncaster Green
- JT LNER V2 No. 4771 Tender Doncaster Green

BR Lined Green

In the mid-90s, the National Railway Museum decided to repaint Green Arrow back into BR Lined Green, with number 60800 for a change, after her overhaul. One of her greatest adventures in preservation was in 1999 whilst wearing this livery, when 60800 covered for 60007 Sir Nigel Gresley on a tour from Didcot to Plymouth – never before had a Gresley V2 tackled the infamous South Devon Banks of the former Great Western Railway. Nobody could know just how well the loco would perform over the fearsome grades in the pouring rain, but despite some signal checks and slipping she coped fantastically!

Scenario editor list names:

- JT LNER V2 No. 60800 BR Lined Green
- JT LNER V2 No. 60800 Tender BR Lined Green

LNER Doncaster Green (2000s)

After a relatively short spell in BR Lined Green, Green Arrow went back to 4771 in LNER Doncaster Green circa 2005/2006. Interestingly, this happened after 4472 Flying Scotsman had been withdrawn for its legendarily lengthy and expensive overhaul, and it seems plausible that the return to LNER livery was at least partially a marketing ploy to make Green Arrow look like her unavailable cousin, in order to run the same annual summer York-Scarborough return trips.

2-3 years later 4771 had become a very tired old lady and, just like so many of her sisters before her in the BR days, she was suffering from a severely cracked monobloc casting that needed replacing and was withdrawn for static display. After nearly 30 years of continuous hard work promoting the best of the LNER across the country, 4771 Green Arrow is permanently retired and enjoying a well-earned rest in the halls of the York and Shildon National Railway Museums, and is apparently destined to be one of the star exhibits at the new NRM Leicester outstation at the Great Central Railway, 'Main Line'. Let us hope that 4771 will one day be overhauled to run again.

Scenario editor list names:

- JT LNER V2 No. 4771 Doncaster Green 2000s
- JT LNER V2 No. 4771 Tender Doncaster Green 2000s

COACHES

Just Trains BR Mk.1 coaches

This LNER V2 Advanced package includes six types of Mk.1 coach created by Just Trains. All are complete with passenger view, a unique leaking steam effect from the coach heating system and connecting vacuum hose pipes and steam heat pipes. The steam heating can be turned on and off from the locomotive footplate control.

The included Mk.1 coaches were overhauled for the recent release of Just Trains' LNER K4 Advanced package and now include new steam heat scripting with advanced random leakage and pressure propagation effects – you can see the steam slowly travelling from the locomotive end of the train to the other end! The textures have been significantly enhanced, with more realistic shading and colouring, and the sounds have also been improved.

This LNER V2 Advanced package sports the largest collection of Just Trains Mk.1 coaches yet, with liveries including BR Maroon, BR Crimson & Cream, BR Chocolate & Cream, BR Corporate Blue & Grey, WCR Red, West Highland Line Tourist Apple & Cream, Kyle Line Tourist Apple & Cream, and introduces the all-new Intercity Executive livery.

Brake Standard Open

First Open

Tourist Standard Open

MatrixTrains LNER Gresley Teak coaches

As if the BR Mk.1s were not enough, the highly appropriate LNER Gresley Teaks from MatrixTrains are also included. These exquisite models include a beautiful passenger view, updated textures, simulation and audio, and also the Just Trains steam heating effects. These coaches also interact intelligently with the LNER V2 in order to simulate the lack of direct admission valves in Advanced mode, where the train brakes take much longer to apply and offer a more challenging drive.

These V2 Advanced editions are entirely separate from the original pack so that you can mix and match the original coaches with their new texture varieties. To add further variation to the LNER-liveried coaches, this V2 Advanced add-on includes no less than three different sets of varnished teak coaches, with each set showing different states of wear and tear, different wood grain patterns and colours, different coloured frames and wheels etc. Mix and match as many coaches as you like from the original MatrixTrains pack and the three Just Trains editions to create highly authentic and diverse Teak trains.

The LNER Gresley Teaks are in LNER Varnished Teak in three states of cleanliness, and in BR Crimson & Cream and BR Maroon liveries with intermediate weathering.

Brake Composite Corridor (BCK)

Brake Third Corridor (BTK)

First Corridor (FK)

Restaurant Composite (RC)

Sleeping Composite (SLC)

Third Corridor (TK)

INSTALLATION, UPDATES AND SUPPORT

You can install this add-on as often as you like on the same computer system. To re-download the LNER V2 Advanced software:

1. Click on the 'Account' tab on the Just Trains website.
2. Log in to your account.
3. Click on the 'Your Orders' button.
4. A list of your purchases will appear and you can then re-download the software you require.

Website updates

Please check the Just Trains website for any news or updates for this LNER V2 Advanced add-on and for our other products.

Technical support

To obtain technical support (in English) please visit the Customer Service section on the Just Trains website. As a Just Trains customer you can obtain free technical support for any Just Trains or Just Flight product.

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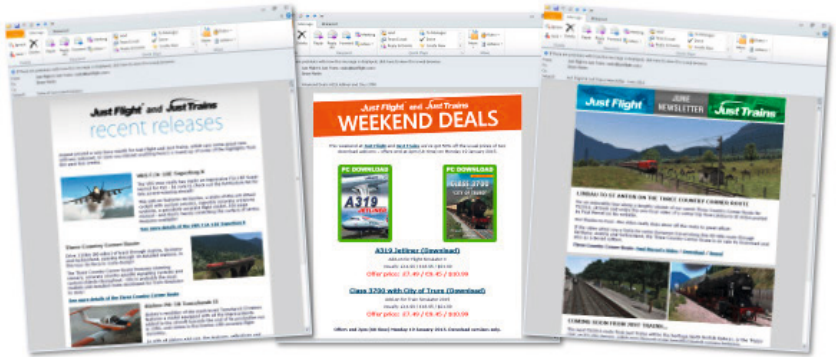


Uninstalling the software

To uninstall this software from your system:

- Go to the Windows Start menu and select ‘Control Panel’ (if you are in Windows Classic view, Control Panel will be found under ‘Settings’).
- Double-click on the item ‘Add or Remove Programs’ (Windows XP) or ‘Programs and Features’ (Windows Vista or 7). In Windows 8 and 10 move your mouse to the bottom left corner, right-click with your mouse, then left-click on the ‘Programs and Features’ menu that appears.
- Select the program you want to uninstall from the list provided and click the ‘Uninstall’ option.
- Follow the on-screen instructions to uninstall the program.

Uninstalling or deleting this software in any other way may cause problems when using this program in the future or with your Windows set-up.

ADVANCED FEATURES

As far as possible the typical operations of a real steam locomotive are recreated in this simulation. Fully replicating a realistic steam locomotive in Train Simulator is simply not possible, but we have added features which bring that dream closer to reality and give you a genuine feeling of what the real locomotive is like. We believe this LNER V2 Advanced add-on gives you the most authentic experience to date of operating and driving a steam locomotive.

The Advanced locomotive features include:

ActivHints

This training system can be toggled on and off at any time. It provides useful hints and tips for operating the loco and also informs you of where you are going wrong and how you could improve your practice, or of urgent matters such as low water in the boiler.

ActivFireman

When activated, ActivFireman will take over the firing responsibilities so that you can just enjoy the drive. ActivFireman is more intelligent than the default host simulation fireman, by knowing when you need a large fire and responding to a lack of steam production or excess steam lifting the safety valves.

Note: *The default Train Simulator automatic fireman MUST be turned OFF in the game settings.*

Detailed and authentic audio

The sound set has been created from a recording from right next to the smokebox of Green Arrow storming the North Yorkshire Moors Railway. Many of the cab instrument and equipment sounds are brand new and were recorded from a static and cold locomotive to enable us to pick out the sounds that would be difficult to capture on a working locomotive. Noisy run sounds and track joints are just some of the additional features of the sound set which provide such an evocative experience.

Two types of regulator valve

The V2s were originally fitted with a single split-cast double-beat valve, of the Owen balanced type, with the bottom and top halves moving independently for a short interval. However, the valve halves were prone to not seating properly and leaking steam into the steam chest, which eventually resulted in a runaway accident at the Swindon Test Plant. The regulator was subsequently changed to a more modern single-seat type that proved to be much safer. The original regulator is simulated on the Doncaster and Darlington Green and the Unlined Black historic models, whereas the BR Lined Black and Green liveries and preserved Green Arrow models are simulated with the later, less leaky type.

Operating snifter/anti-vacuum valve

This protects the cylinders from damage when there is no passage of steam through the cylinders. It helps to prevent hot gases and ash from being sucked down the blast-pipe and into the piston valves and cylinders. Monitor the state of the snifter valve by listening out for the air hiss in time with the cylinder movement when it's open, and see the blast of steam shooting upwards out of the valve (located behind the chimney) as the steam chest pressure rises and the valve closes.

Realistic reverser behaviour

The reverser lock is required to lock the reverser in place when the driver is not moving it, to prevent it from oscillating with the Walschaerts valve gear and creeping into forward gear. The reverser lock can only lock the reverser when the lock lug can sit between the teeth of the reverser cog wheel hidden inside the reverser pedestal. The reverser continues to wobble slightly due to play in the locking mechanism.

Note: *As in real life, the reverser operates in the REVERSE direction from other locomotives. To move forward you need to wind the reverser BACKWARDS and to move the locomotive in the reverse direction you must wind the reverser FORWARDS!*

Important! *As in real life, you should always coast the locomotive with no more than 25% cut-off when travelling at speeds greater than 25 MPH; this ensures that the middle engine does not over-travel far enough to break the Gresley conjugated gear. Failure to do this will increase the chance of the valve gear breaking as speed and cut-off increase from these safety margins.*

Davies & Metcalfe vacuum ejector with realistic brake simulation

Features include vacuum brakes that take longer to apply or release depending on the length of the train, the simulated diffusion of air into and out of the train pipe, and brake behaviour being dependent on the type of train being hauled: direct admission (e.g. Mk.1s), non-direct admission (e.g. Teaks) and unfitted (e.g. unfitted freight trains). The number of leaks in the consist is also approximated based on the classification of the train, so that there are more leaks in a fitted train of wagons than in a train of coaches of a similar length.

Scripted BR Automatic Train Control – BR liveries only

For the first time in a Just Trains product, the original British Rail Automatic Train Control (ATC) system is simulated – on BR liveries only. This system was the direct precursor to the modern AWS.

The BR ATC system operates in much the same way as the later AWS system that you are probably more familiar with. The difference is that pressing the reset lever when the warning horn is not sounding will cause the brakes to apply, and that the brakes will immediately start to apply as soon as the warning horn starts to sound, instead of there being a short time limit before a sharp emergency brake application is induced. The good news is that there is no time limit to reset the ATC equipment and cancel the brake application!

Scripted Automatic Warning System and Train Protection Warning System – 4771 (2000s) preserved only

The AWS/TPWS system is the same as when fitted on a modern locomotive or unit. If you fail to press the reset lever within 2.7 seconds of the horn starting to sound, there will be an emergency brake application which you cannot cancel (without some naughty TPWS isolation!). It is not currently possible to simulate full TPWS with interaction with the various different signalling systems in Train Simulator on an Advanced model such as the V2, due to restrictions on what signal messages the locomotive scripting is able to receive, but the TPWS ensures that you must wait until the train has come to a complete stop or 59 seconds have passed before you can cancel the emergency application, so don't get caught out!

Scripted wheel animation, wheelslip and wheelskid

Scripting takes the responsibility of simulating and correctly rendering the wheel animation. The driving wheels will accelerate with wheelslip, decelerate to a halt during wheelskid (when the steam brake is applied harshly) and turn in the opposite direction of travel if the reverser is wound back into the opposite gear.

Chuff sounds and exhaust effects

These are always accurately synchronised with the wheel position, even during wheelslip and wheelskid.

Quillable whistle

Produce different notes and play tunes on the whistle by dragging the whistle levers up and down. "On Ilkley Moor Baht 'At!"

Weather and seasons have a direct effect on adhesion

You could be working hard driving up a steep gradient perfectly well in dry weather, but then the heavens suddenly open with rain, sleet, hail or snow and you can soon find yourself in a whole heap of trouble as precipitation begins to build up on the rails.

Realistic water levels and gauges

See the photorealistic water level rise and fall with gradients, while also sloshing back and forth during acceleration and deceleration, and oscillating as the water in the boiler boils over. Note how opening the regulator raises the height of the water as a result of local pressure above the water at the regulator valve and causes the water to oscillate frantically. See how the water reverses the chevrons on the gauge glass backplate by refraction.

Permanent damage and solvable performance suppressions

This includes cylinder explosion due to an excess of water in the cylinders, either when priming or due to the build-up of condensation, the loss of connecting rods when wheelslip goes out of control, or the Gresley conjugated valve gear breaking due to middle valve over-run when coasting at a cut-off greater than 25%.

Fully modelled 3D firebox interior

The firebox interior includes fire, fire bed and coal animations. The fire bed and coal rise as you add more coal to the fire.

Realistic damper and fire temperature control

Use both the main damper wheel to control the main air stream through the fire bed and the fire flap to control the secondary air through the fire hole in the cab. Be warned that using the overall fire door instead of firing through the main flap will have a significant adverse effect!

Intelligent and advanced firing

'Lumps' of coal are thrown into the fire instead of a steady stream. Closing the fire doors automatically turns off the firing control. The fire glow gets paler and brighter as the locomotive works harder, while flashing in time with the exhaust.

Davies & Metcalfe exhaust injector

Use exhaust steam from the cylinders or automatically switch over to live steam from the boiler when the steam chest pressure is very low.

Tender controls

Drag the tender water feeds down to provide water to the injectors, click on the LNER hand oil lamp for some light in the cab when it gets dark, and turn the handbrake.

Steam heat control

Keep your passengers on board the passenger coaches nice and toasty during the winter season, and see the steam leaks from the carriage steam heat pressure relief valves and sometimes shoddy piping! The gauge will rise to maximum pressure at a varying speed depending on how wide you open the valve. There is a random leak rate which will be slightly different each time you drive, so you should open the valve just far enough to maintain pressure against leaks from the pipe.

Intelligent communication

Intelligent communication is provided between Advanced locomotives – couple one or more V2s together, or double-head with a Just Trains 4MT, Clan, 5MT, V2 or Manor for synchronised control of cylinder drain cocks and regulator, and for communicating with a little toot of your whistle!

Advanced and photorealistic smoke and steam effects

See the main smoke stack change density and velocity with the change in blast-pipe pressure and change colour with stoking and the change in fire mass. Use the colour of the smoke to determine the temperature of the fire – lots of black smoke indicates more coal being thrown into the firebox than the fire can burn! See the steam leaks from the safety valves and the chime whistle flutter with the air flowing past the loco at speed. Notice the steam emissions from the cylinders in time with the motion. Beware of water droplets blasting out of the cylinder cocks and chimney, indicating a serious case of priming!

Realistic and detailed external animations

These include loco brake linkage, cab side windows, sliding cab roof hatches and realistically moving mechanical lubricators.

Visible raindrops

These will appear on the windows of the exterior model.

Advanced AI

AI trains whistle when starting to move and open and close the cylinder drain cocks automatically. In bad weather AI trains may even wheelslip and apply the sanders intelligently. For other loco's in the player consist, such as in double-headers, other V2s, K4s, 7MTs or 5MTs have a more 'human' personality in their response to the player driver and loco. They self-manage their cylinder cocks and reverser at standstill. They try to copy the player driver's use of regulator and reverser but only after they're confident that the player needs them to provide assistance and isn't just dabbing the regulator momentarily to maintain momentum, and only if they're not wheelslipping themselves. When at a standstill, they will only get ready when you warn them with a short toot on your whistle, otherwise you will pull them away when they're not prepared.

Headcode

You can change the headcode to whatever you like, whenever you like, or via the number string in the Scenario Editor. Player and AI loco's can both have their headcode pre-set in the Scenario Editor for additional scenario authenticity.

LNER hand lamp

This is a useful appliance for when it gets a bit dark in the cab and is stowed on the tender's locker on the fireman's side.

Driving in a double-header

Before you start to move off, you should inform the other driver that you're ready to go by pressing [B] to give a short toot on the whistle. The other driver will put his loco into gear and, once he is ready, will toot back to you. Once he has tooted back, you can set off. If you fail to inform the other driver that you want to go, his loco will leave in mid-gear and he will get into a panic trying to get his loco ready whilst you're pulling him away!

Fill sandboxes

Remove their lids and watch the sand level rise as you fill them. If you run out of sand during a run you can stop the train and replenish the sandboxes at any time.

Reverser lock

The reverser must be unlocked, by pulling the locking latch upward, before it can be moved. You can hear the air hiss as the vacuum clutch valve is released in tandem with the mechanical lock.

Steam chest

There is a delay between opening/closing the regulator and the subsequent change in steam chest pressure and the supply to the cylinders. The delay varies depending on how saturated the internal steam pipe system is and how much the main valves are open. There is also a simple implementation of the piston valve action controlled by the reverser, which brings the simulation a step closer to replicating the real thing.

Operating independent loco and tender brakes

The locomotive and tender are braked by vacuum via the main train pipe and do not have an independent brake control. However, the loco and tender brakes can be released even when the train brakes apply. Releasing the vacuum reservoir will allow the loco and tender brakes to release whilst the brakes on the rest of the train remain applied, which is useful if the locomotive driving wheels start to slide and skid. In American parlance this is known as 'bailing off'.

Authentic vacuum brake

The vacuum brake on the V2 Advanced locomotives is of the Davies & Metcalfe type, which was popular on the larger vacuum-only locomotives on the LNER such as the A3s and A4s. It was also one of the features that Oliver Bulleid took with him when he left the LNER to become Chief Mechanical Engineer of the Southern Railway, as can be found on the numerous Bulleid Pacifics.

Press and hold the [J] key to increase and [Shift]-[J] to decrease the small ejector, which you'll be mostly using, and press and hold the [;] key to push the main brake valve past a spring-loaded stop at the running position to engage the large ejector, useful for releasing the brakes more quickly. Tap the ['] key to return the main brake valve to the running position and turn the large ejector off. Both are used to create a vacuum in the train pipe and overcome any losses in vacuum due to leaks.

The large ejector is normally used to release the brakes more rapidly, particularly with longer trains, and uses more steam. The small ejector can be used to release the brakes fairly quickly when light engine, but may take quite a while on longer trains. The small ejector is also used to maintain the vacuum in the train pipe whilst running, and to maintain the vacuum in the reservoir. Note that it is quite acceptable if the small ejector can't quite maintain 21 inches Hg, as long as it can maintain train pipe above 19 inches Hg.

Cylinder drain cocks

These are operated via a series of levers and a steel wire from the cylinder cock lever on the fireman's side of the footplate. After long stationary periods it is important to start the locomotive with the cylinder cocks open in order to flush out the simulated condensed water. The cylinder drain cocks are also the only way of preventing the cylinder from blowing up as a result of priming. Push forwards to open and pull back to close.

Priming

Priming occurs when the water level in the boiler is able to reach the regulator valve, right in the dome. This means that when the regulator is opened, water enters the steam pipe system. Consequences of priming include:

- Some water evaporates rapidly into steam when passing through the superheater and fills the steam chest with saturated (non-superheated) steam. (Because of the extraordinarily high concentration of water in the exhaust vapour, the exhaust will turn a brilliant white.)
- Because water is forcing its way through the regulator valve under immense pressure, priming can prevent the regulator from being closed completely. To overcome this, open the regulator as far as it will go and quickly shut it again. This may take a couple of attempts.
- Some water does not evaporate and finds its way into the cylinders. You will know when this happens as water will erupt from the chimney and will be squeezed out of the cylinder drain cocks. It is therefore paramount that the cylinder cocks are opened very quickly to exhaust all the water before the pressure in one of the cylinders becomes high enough to blow out the cylinder cap. If the cylinder blows up, it's game over. You will see the blown cylinder.

Realistic injector performance and steam usage

Always remember that an injector's water valve must always be open whenever the injector's steam valve is open, which means opening the water valve first and closing the water valve last. Opening the steam valve without any water could lead to injector failure until it has cooled down sufficiently!

Unlike the BR Standards, the water valves under the driver's and fireman's seats are only trimming valves to adjust the flow rate – they do NOT turn off the water! You must use the tender feed valves to start and stop water flow from the tender.

For the live injector, you will need to balance the opening of the steam valves against how far open the water valves are – more water flow requires more steam to mix properly and pick up. Listen out for the faint hiss as you open the steam valve until you hear the injector singing, with just a faint steam emission from the injector overflow. If you open the steam valve too far and deliver too much steam for the quantity of water, the injector will blow back with an almighty roar!

For the exhaust injector, to ensure that there is always enough steam to inject the water when the steam supply is variable, as is always the case with exhaust steam, you should open the steam valve fully and use the trimmer valve to adjust the water flow rate and balance out the steam supply. Therefore, expect to need to open the trimmer valve further for full regulator usage, and to reduce it for quarter to half regulator. In live steam only mode, when the regulator is closed and the steam chest pressure is less than one third of the boiler pressure, you may need to operate the exhaust injector more like the live injector and adjust the steam valve, although always set the water trimmer first when trying to get the injector to pick up.

Once you have finished using the exhaust injector, you can just shut off the steam valve and the exhaust injector will automatically stop the flow of water. The tender water feed for the exhaust injector is therefore left open by default. For the live injector, after shutting off the steam valve, you must also close the tender's live water feed, otherwise the water will be wasted all over the ballast! For both injectors, you do not need to adjust the water trimmer valves unless you are struggling to get the injectors to pick up.

The V2 Advanced is quite a thirsty model, so you will be using the injectors frequently. The live injector uses much more steam than the exhaust injector, but the trade-off is that it has a bigger cone and so the water flow rate is greater.

Use both injectors strategically and plan ahead along your route. They are very useful for keeping boiler pressure under control when coasting or coming to a stop. They will also have a detrimental effect on steam generation, because you are adding relatively cold water to the boiler, so it is not always ideal to use them for long periods when climbing a steep gradient.

LNER gravity and steam sanders

The gravity sander lever must be pulled towards the driver to operate the gravity sanders for when the locomotive operates in forward, and pushed back to close them. To balance the effectiveness of the sand versus the conservation of sand in the sandbox and for the best control over erratic sand flow, jockey the lever backwards and forwards to continuously open and close the gravity sander.

The steam sander is operated by simply opening the steam sander valve to provide a small amount of sand compared to the gravity sander. There are NO sanders provided for reverse travel! Using sand depletes the sand level in the sandbox, and when the sandbox is empty the sanders can no longer apply sand to the railhead and improve adhesion. You can stop the train at any time, apply the handbrake and refill the sandboxes as described in the 'Refilling the sandboxes' section below.

Refilling the sandboxes

When driving in Advanced mode a finite quantity of sand is available for the sanders so you might want to top up the sand in the locomotive sandboxes, especially if you have completely run out! To do this, simply bring the train to a stop and, once the loco is stationary, hold down [Ctrl]-[Shift]-[X] to remove the sandbox lids and pour in the sand. You will see the sand level rise to the top of the sandbox pipe, just below the lids. Let go of [Ctrl]-[Shift]-[X] to replace the sandbox caps and you can set off again.

Note: *You MUST be stationary to refill the sandboxes – stopping and then driving off while filling the sandboxes will stop the refilling process!*

Cabview camera positions

This locomotive uses the Train Simulator multi-position cabview camera to provide various driving positions, including a head-out view out of the side windows that allows you to continue to grab the controls with the mouse and have full freedom of head movement, and a view of the internal firebox to monitor the fire. You can see all of the same highly realistic animations on the exterior model from your cabview positions, including the valve gear and lubricators, as well as being able to see the correct details such as the nameplates and the lamps set for the headcode.

Animated exterior model cab controls

Look into the cab from an exterior camera and you will notice the regulator, reverser and brake moving as well as the fire roaring away behind the animated firebox flap and door.

DRIVING OPTIONS

Please read this chapter carefully before driving the LNER V2 Advanced locomotives.

This LNER V2 Advanced simulation is probably the most advanced steam loco currently available to drive in Train Simulator and therefore needs to be set up and operated correctly. The locomotive can be in several different states and it is important to understand them so that the correct one is used in specific situations.

Advanced

This is the default locomotive mode and has complex controls with realistic operations and reactions to give you the most authentic experience possible of driving a Gresley V2 steam locomotive.

Intermediate

This mode minimises the complexity of the controls in Advanced mode, such as removing the steam chest effect, reverser lock and creep, the train length affecting brake performance and so on. This mode also disables the damage modelling to provide a more relaxed experience. Press the [Return] key (the large key on your main keyboard with the 'Return' arrow on it) to switch between Advanced and Intermediate modes.

The Intermediate mode features:

- ActivFireman compatibility
- Dynamic particles
- Oscillating water level gauge
- Headcodes
- Communicating loco's in double/triple/poly loco headers
- Scripted wheelslip
- Steam heat
- Speedometer linked to wheel speed
- Exterior animations
- Cylinder cock leak activated by track markers in scenarios
- Operating LNER hand lamp
- Handbrake controls on the tender

The main differences between the Intermediate and Advanced modes are that in Intermediate mode:

Regulator – standard operation with no steam chest effect.

Reverser – no reverser lock.

Brakes – no train length effect on release and application, and no requirement for the small ejector to overcome leaks.

Firing controls are all basic – normal damper, blower, normal fire doors, normal injector controls and normal stoking.

Sanders are unlimited – just the one basic sander.

Simple

To access Simple mode, simply change your Train Simulator gameplay driving options from ‘Expert’ to ‘Simple’ in the Settings>Gameplay menu. ‘Simple’ mode is the ‘Stop/Go’ control mode, which provides you with the absolute bare minimum of driving controls and is therefore rather like controlling a simple model railway locomotive. You can focus on enjoying watching the LNER V2 against of the scenery of the route, without worrying about any of the operational aspects of the loco.

When you are driving in Simple mode the LNER V2 Advanced locomotive has all the visual ‘bells and whistles, tricks and treats’ as when it is in the Advanced or Intermediate mode, including:

- Dynamic particles
- Oscillating water level gauge
- Headcodes
- Communicating loco’s in double/triple/poly loco headers
- Steam heat
- Speedometer linked to wheel speed
- Exterior animations
- Cylinder cock leak activated by track markers in scenarios
- Operating LNER hand lamp
- Handbrake controls on the tender

CAB CONTROLS

Please note that although all the cab controls, instruments and indicators are modelled and might be animated, some may not be functional in this simulation. This is due to the limitations of what is possible in the host simulator.

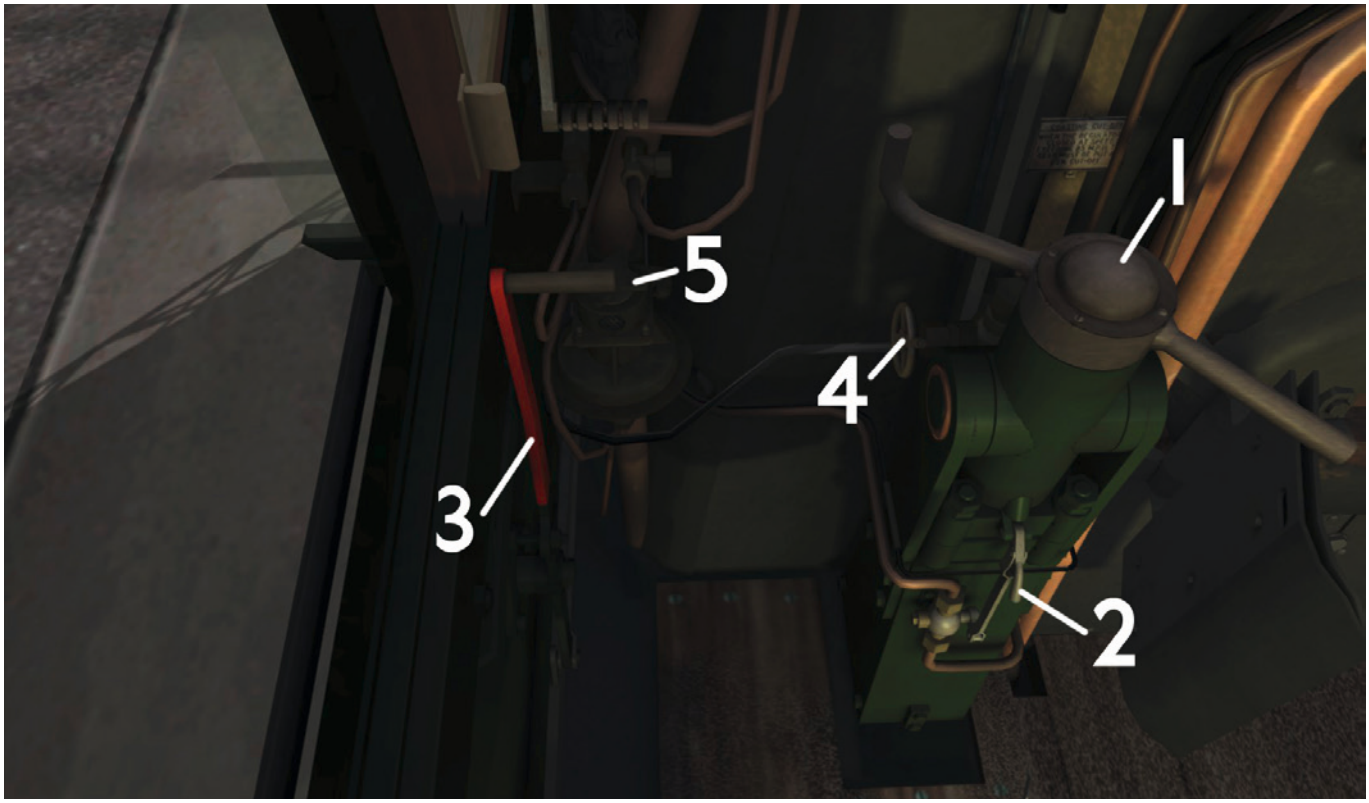
To drive the locomotive with Advanced or Intermediate controls, the ‘Automatic Fireman’ needs to be OFF and the Expert Controls must be set to ON. You can check this via the Settings>Gameplay menu.

The text in square brackets below refers to the keyboard commands.

Many of the controls have mouse-over tips. Briefly hold your mouse over them to see their operation requirements.

Detailed information on the functions of the cab controls is provided in the DRIVING THE LNER V2 ADVANCED LOCOMOTIVE chapter of this manual.

Lower left



1. **Reverser**

   The simplest analogy for the steam locomotive reverser is to think of it as being the gearstick/shifter paddles of a manual or semi-automatic car. As a general rule of thumb, start the locomotive in full gear, which is 65% cut-off in forwards and -65% cut-off in reverse, and never start the loco with less than ±45% cut-off – not only will the loco struggle to start moving at lower cut-offs, but it is also likely to collect a lot of condensed steam in the time it takes to get useful work out of the steam in the steam chest and cylinders. As your speed increases, wind the reverser back down or up towards ±10%. This is like shifting up through the gears of a car and, like in a car, saves fuel, because smaller percentage cut-offs use less steam.

   Furthermore, when you need a kick in power for climbing up a hill, increase the amount of cut-off, like falling back into 4th and 3rd gear when your little 1.1 litre car encounters a steep hill! Use the mouse to rotate by dragging up or down, or use the [W] and [S] keys to increase/decrease cut-off respectively.

   Reverser creep – for safety reasons it is very important that you lock the reverser after moving it, otherwise the reverser will start to take on a mind of its own and rock back and forth while steadily moving itself towards full forward gear (65% cut-off).

2. **Reverser lock**

   You need to release this lock to allow the reverser levers to rotate – use the mouse or press the [E] key to toggle. The lock should be re-engaged after each movement of the wheel.

3. **Gravity sanding lever**

   The operating bar is located to the left of the driver's seat on the cab sidewall and must be pulled towards the driver to operate the main sanders for when the locomotive operates in forward only in Advanced mode, or in both directions in the Intermediate mode. Using sand will deplete the sand level in the sandbox. You have 30 minutes of continuous use before the sandboxes run out, after which the sanders will no longer be of any use and you will have to stop and refill the sandboxes if you need them again.

   You can stop the train at any time and refill the sandboxes as described in the 'Refilling the sandboxes' section of this manual.

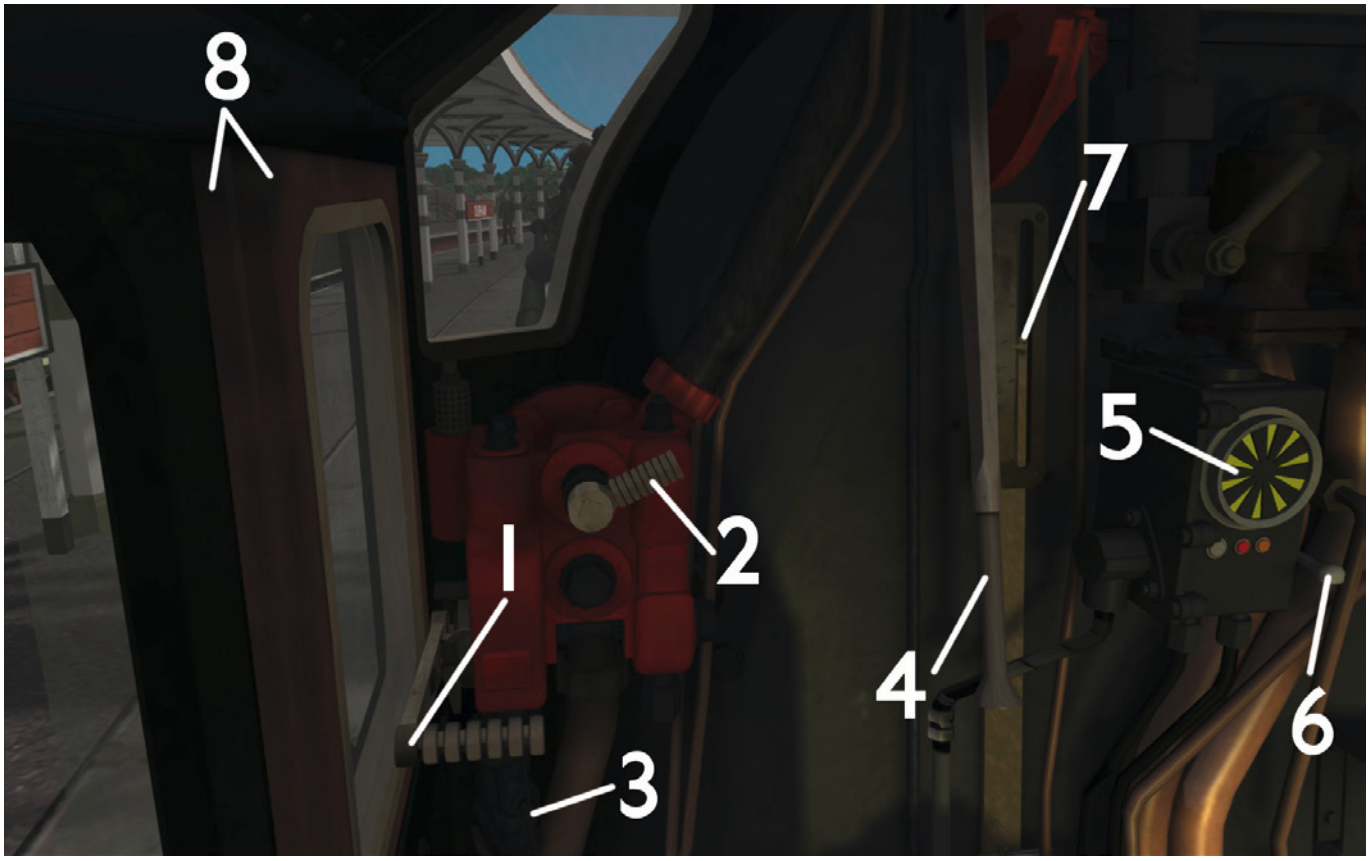
4. Steam sanding valve

The steam sanding valve provides an auxiliary supply of sand and is less effective than the gravity sander, but as a result it uses less sand. It is only available for forward motion in Advanced mode, but can be used for either direction in Intermediate mode.

5. ATC isolation valve

The isolation valve is a simple screw that pushes down against the ATC brake valve diaphragm when screwed in. This stops the ATC brake valve from delivering air into the train brake pipe and applying the brakes during an ATC brake demand, thus isolating the brake system from the ATC system. Note that the ATC bell, horn and reset lever will continue to operate as normal.

Upper left



1. Train brake

This affects ALL the brakes on the train, including those on the carriages, and is the brake normally used when pulling fitted rolling stock. Push the handle upwards to release the train brakes and pull it downwards to apply them. Pushing it upwards past the mid-point and running position notch will engage the large ejector. You can also use the [;] key (semi-colon) and [‘] key (apostrophe) to operate it. The brake is quite sensitive, so go steady when you make an application. Listen to the rush of air entering the train pipe and use it to assist your judgement of how much of an application to make, particularly in head-out view.

2. Small ejector

This is used to release the brakes more slowly than the large ejector whilst also using less steam than the large ejector, and to maintain the vacuum in both the train pipe and the locomotive and tender vacuum reservoir against air leaks.

Brake notes: *In Advanced mode you need to have the small ejector open sufficiently at all times to prevent leaks in the brake pipe from slowly applying the brakes. Also, the brakes will not release fully unless you have at least 19 inches Hg of vacuum showing in the vacuum gauge.*

The LNER V2 is fitted with vacuum brakes to brake both the train and itself and its tender. Use the small ejector to create a vacuum with the vacuum brake handle in the RUNNING position to create a vacuum in the train pipe to release the brakes, and engage the large ejector as well by pushing the brake valve past the running notch and up into release for a faster brake release. Note that the running position is about the mid-point of the brake valve lever, when it is just slightly inclined from the horizontal. The small ejector is slow and uses much less steam than the more expensive and much faster large ejector, but you must leave it on to maintain a vacuum and overcome any leaks (Advanced mode only). Pull the vacuum brake handle carefully towards you and downwards to destroy the vacuum in the train pipe and apply the brakes. On the vacuum brake duplex gauge you can see the vacuum train pipe pressure on the left and the vacuum reservoir pressure on the right. The difference between these two controls the locomotive's vacuum brake.

3. Reservoir release

Pressing this releases all the vacuum pressure in the vacuum reservoir tank. Use the mouse to do this. Note that the reservoir vacuum pressure will fight destruction if the vacuum pressure in the train pipe is greater, and that the small ejector will recharge the reservoir if the vacuum brake handle is left in the fully ON position (all the way down), so ensure that the small ejector is turned off.

4. Regulator

This is essentially the throttle of a steam locomotive and is used to regulate the flow of steam from the boiler into the steam chest. Gently pull the regulator towards you until the steam chest pressure starts to rise. Pull it further towards fully open to increase the steam chest pressure. Be aware of the delay between your action at the regulator and what actually happens at the steam chest. The [A] and [D] keys can be used to move the regulator, as well as the mouse.

The regulator takes some getting used to at first, but with practice you will become accustomed to its behaviour. If the cylinder cocks are open, open the regulator a good way and leave it until the train begins to move. If the cylinder cocks are closed, pump the regulator a few times, pulling the handle a fair way each time with no little dabs, while you wait for the steam to reach the cylinders. Then, as you start to move, leave the regulator open a little.

5. AWS/ATC indicator

The 'sunflower' indicator will display the yellow and black sunflower pattern when the loco is driven on an AWS-equipped route and has had the AWS warning cancelled by the driver.

6. AWS/ATC reset lever

Press the [Q] key or click on the silver lever to reset the AWS when acknowledging a warning, or click on the small reset lever on the right-hand side of the AWS apparatus.

AWS notes: *The Automatic Warning System is a very basic form of in-cab signalling and serves to remind the driver that the last signal was at caution and he is potentially approaching a signal at danger, whilst ensuring that the train is brought safety to a stop should the warning not be acknowledged for whatever reason, e.g. if the driver becomes incapacitated or did not notice either the signal or the AWS warning whilst driving with head out of the window. It could also be considered as a vigilance test, ensuring that the driver is awake and keeping a keen eye out for approaching signals, although in cases of extreme fog where signals are less visible it can assist the driver by audibly notifying him of adverse signals.*

The Just Trains LNER V2 Advanced features two different types of AWS system. The first type, fitted to the BR Green historic liveries, is the original 1958 BR ATC system, which was an early form of the standard BR AWS system that continues to be used to this day. The second type, as fitted to the preserved Green Arrow model in its 4771 (2000s) guise, is the aforementioned standard BR AWS, combined with 21st century TPWS (Train Protection & Warning System). Both types operate in much the same way, but with some differences.

In both types, as the locomotive passes over an AWS yellow ramp in the four foot, either a bell will ring out with the all clear or a horn will blast out to warn of a signal at caution or danger. It will only stop sounding the horn if the driver acknowledges the warning by pressing the reset lever.

In the case of the BR ATC system, the ATC will immediately start to apply the brakes slowly until the warning has been acknowledged, so there is no time limit for responding to the warning other than how much speed you're willing to lose due to the brake application! Pressing the reset lever at any time other than during an ATC warning will also apply the brakes, so that drivers don't cheat and hold the lever down by hanging their bag on it to save them the bother!

In the case of the standard BR AWS/TPWS, you have 2.7 seconds to respond to the AWS warning before a very fast emergency brake application is triggered. If an emergency brake application has been triggered by the AWS, the AWS/TPWS will keep the brake application on until the train has come to a standstill.

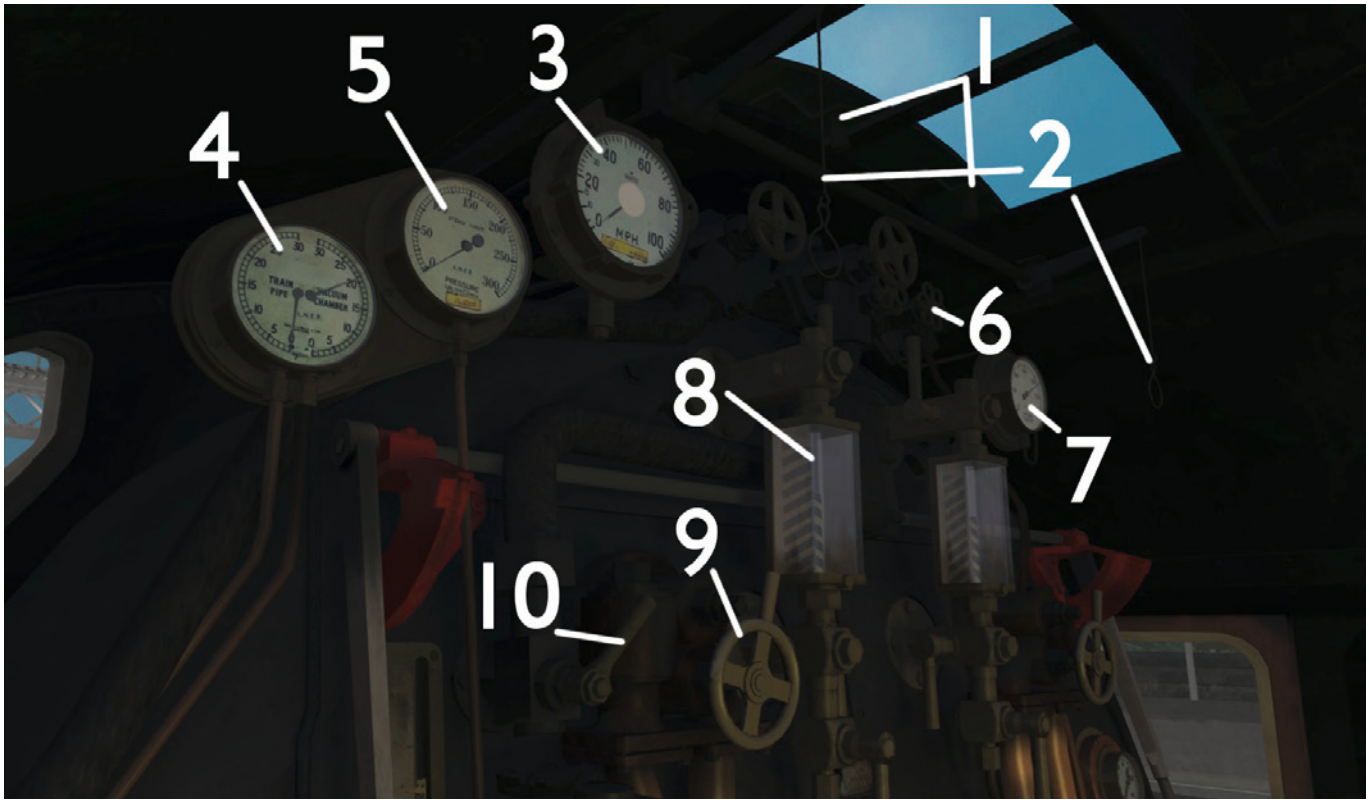
7. Reverser indicator and sector plate

This gives you an indicator of the current nominal cut-off. Below the mid-point of the sector plate is forward gear; above it is reverse gear.

8. Sliding windows (driver's side)

You can move both windows freely – close the windows to keep the warmth in on a frosty winter night, move them out of your line of sight if they're getting in the way and so on. Just don't forget to ensure you push both of them forwards before sticking your head out of the side of the cab, otherwise you're in for a spectacularly sore bump on the head!

Upper centre



1. Sliding roof panels

Drag the panel handles to let some light in and some heat out!

2. Whistle levers

Drag the levers down by the rings to sound and quill the GNR whistle!

3. Speedometer – BR Lined Green, 60800 and 4771 (2000s) versions only

This displays the speed of the locomotive's driving wheels, so most of the time it shows the speed of your train. However, if you see the speedometer needle racing off then you can be pretty sure you've got a wheelslip on your hands, and you can be certain that the wheels have locked up if the speedometer reads 0 MPH while you are moving!

4. Duplex vacuum gauge for train pipe and vacuum reservoir

This indicates the vacuum pressure of the train pipe on the left and the vacuum pressure in the locomotive's vacuum reservoir.

5. Steam chest pressure

The steam chest pressure can be seen on the steam chest pressure gauge in the cab. As this pressure is delivered to the cylinders via the piston valve, it forces the cylinders and hence the locomotive to move. The higher the pressure, the greater the force. Steam is added to the chest by the regulator, and is then exhausted into the cylinders when moving or through the steam chest drain cocks. Alternatively, steam in the system whilst standing will cool down and condense, reducing pressure. The steam chest pressure can never exceed or match the boiler pressure, but it can get pretty close in the right circumstances.

6. Coach steam heat manifold valve

Rotate this wheel anti-clockwise to send steam to heat the coaches. The gauge will rise to maximum pressure at a varying speed depending on how wide you open the valve. There is a random leak rate which will be slightly different each time you drive, so you should open the valve just far enough to maintain pressure against leaks from the pipe.

7. Boiler pressure gauge

This shows the steam pressure in the boiler. Try to keep it just below the red line. Blowing off (hitting the red line) wastes steam and makes an awful lot of noise, so make sure you keep the loco quiet at night!

8. Left side boiler water level indicator

This indicator shows the level of water in the boiler.

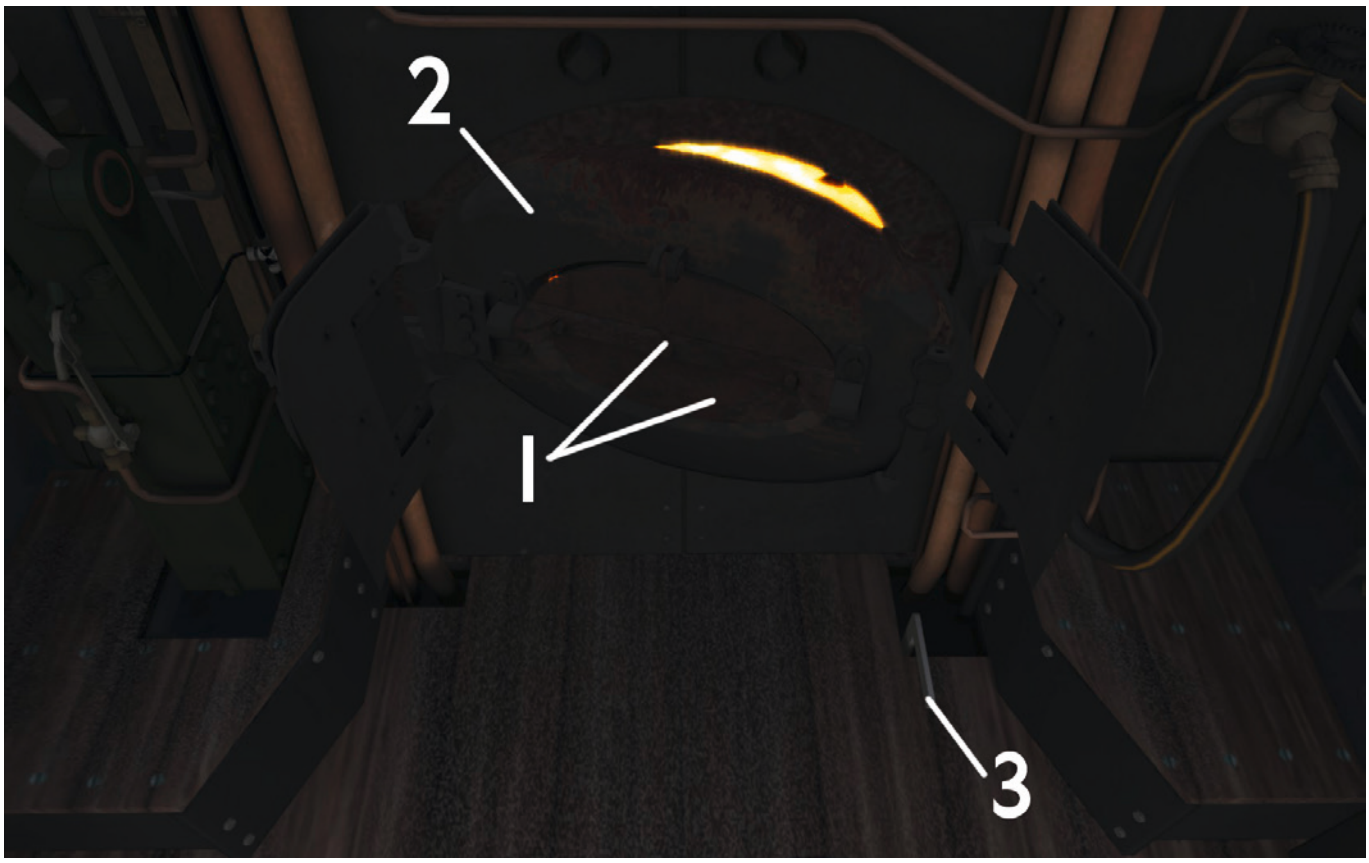
9. Driver's injector (live steam) valve

This is used to inject water from the tender into the boiler, using live steam. It must be used in conjunction with the live injector water feed and live injector water trimmer to successfully inject water into the boiler. Turn anti-clockwise to open.

10. Blower

Use this to increase steam generation at low speeds or while stationary. This is great for those times when boiler pressure has got a bit low and you need to build up as much steam as possible in a short amount of time. Use the mouse or the [N] key to increase the blower and [Shift]-[N] to reduce it.

Central well



1. Fire flap catch and main fire flap

The catch 'catches' the edge of the fire flap between its teeth and stops the flap from falling down into the closed position. The catch has a number of teeth so that you can hold the flap open at different positions. Press [Shift]-[F] to lift the catch up and let the flap drop shut.

Firing (adding coal) – when the fire doors are open you can stoke the fire. The molten coal mass inside the 3D firebox will rise as the mass increases and will descend as the mass is burned through – seeing the grate bars under the coal is not good! Try not to over-fire the locomotive or let the fire get too cold by under-firing, otherwise you will choke the fire with more coal than it can burn, which will be indicated by the grey-brown/black smoke and exhaust colour. Use the smoke colour to help you with firing decisions – if you've got pure black smoke then it's probably time to put the shovel down!

Main fire flap – drag the mouse across it or use the [F] key to push the flap open slowly, or tap the [R] key to whack it open with the shovel. You should always fire through the main fire flap – it might be trickier to see what you're doing but it reduces the amount of secondary air being sucked into the firebox when you don't necessarily want it. In real life you can practically operate the fire flap without taking either hand off the shovel!

Fire flap notes: *You obviously need the fire doors open to stoke the fire. Skilled firemen will also use the fire doors to control the flow of secondary air and therefore maximise control over the fire temperature in conjunction with the dampers. You should close the doors before entering a tunnel and keep them closed while driving through the tunnel unless the blower is on sufficiently to draw the fire away from the fire hole AND the locomotive is travelling at a slow speed.*

2. Overall fire door

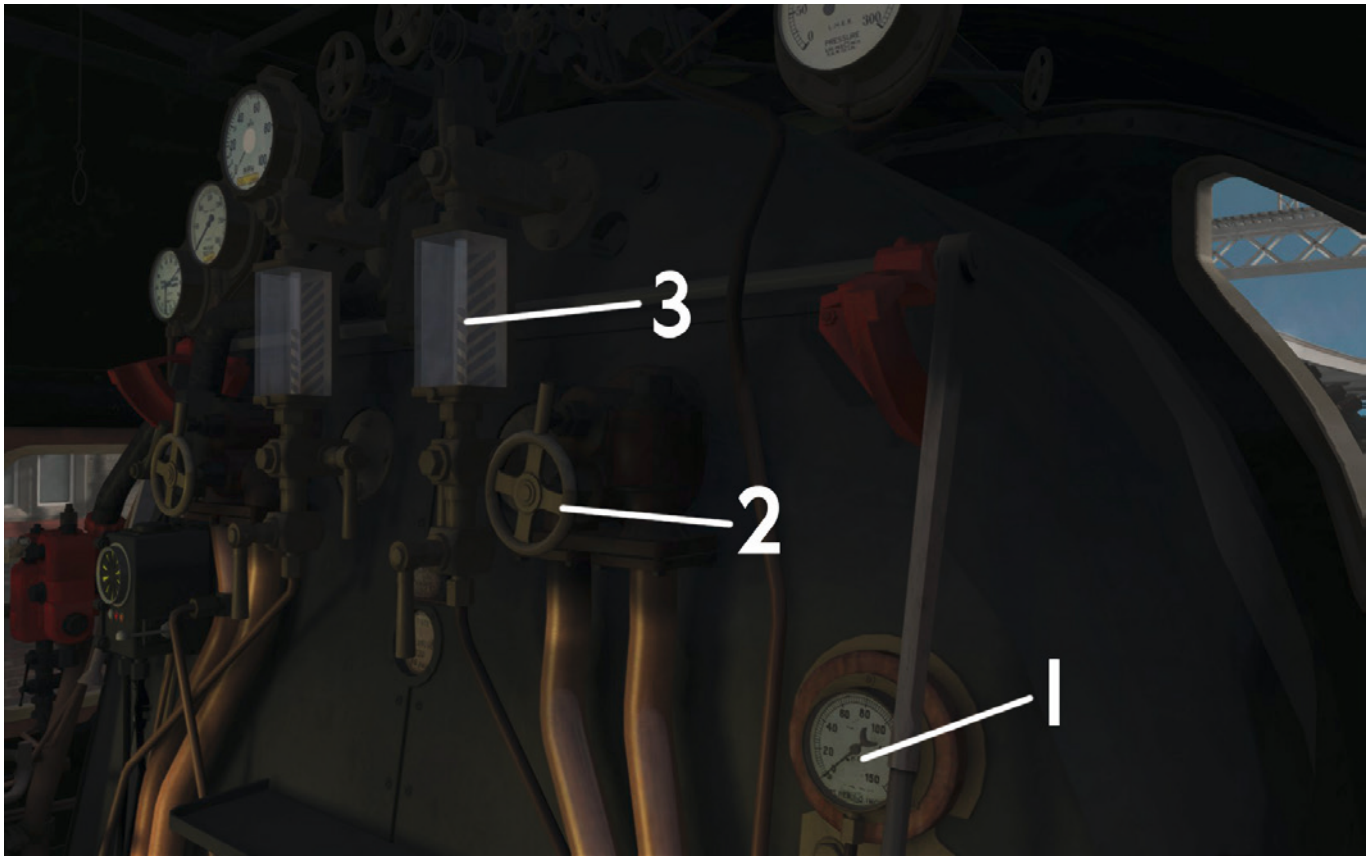
Normally the overall fire door is used for lighting up in the morning and for allowing fitters to climb in (when there's no fire!) to inspect the inner firebox. It is not designed to be used while the loco is running and will let a lot more cold secondary air flow into the fire, but there is no reason not to open it while standing stationary to get a better view of the fire when checking its condition.

3. Damper

This small lever is mounted on the floor on the fireman's side. Mouse-drag anti-clockwise or use the [M] key to increase the damper and mouse-drag clockwise or use the [Shift]-[M] keys to reduce it. This allows more or less primary air into the fire.

Damper notes: *This controls the flow of the main source of air to the fire. Opening the damper increases the flow of air. The more air supplied to the fire, the more oxygen is available and therefore the hotter the fire will burn. Make sure the damper is wide open in situations where a hot fire is required and is closed when you need to cool down the fire to reduce the chance of the safety valves going off.*

Right centre



1. Coach steam heat pressure gauge

2. Fireman's injector (exhaust) valve

This is used to inject water from the tender into the boiler using exhaust steam. It must be used in conjunction with the exhaust injector water feed, otherwise there will be no water to inject. Turn anti-clockwise to open.

3. Right side boiler water level indicator

Shows the level of water in the boiler.

Right back

1. Cylinder drain cocks lever

The drain cocks are vital to ensure that water condensation is not trapped in the cylinders, which could result in them being seriously damaged. Press and hold the [C] key or mouse-drag the cylinder drain cock lever forward to open the cylinder drain cocks. Press and hold [Shift]-[C] or drag the lever backwards to close them.

Cylinder cock notes: *These are used to drain the cylinders of water which collects in the cylinders due to condensation from steam and during priming. You should always leave them open when at a standstill, unless the standstill is very brief, and close them after a couple of wheel turns. If you see water squirting out of the cylinder drain cocks or blasting out of the chimney, it's time to open the cylinder cocks very quickly before a cylinder goes bang.*

2. Fireman's water trimmer (exhaust)

This valve allows water flowing from the tender to the boiler via the exhaust injector to be adjusted to make it easier for the fireman to operate the exhaust injector with variable boiler pressure or exhaust pressure, depending on whether the exhaust injector is in exhaust mode or live mode. Turn clockwise for full flow rate.

3. Tender exhaust water feed

Lower this to supply water from the tender to the exhaust injector. You do not need to raise it again after you have finished using the exhaust injector, so it is often left permanently down.

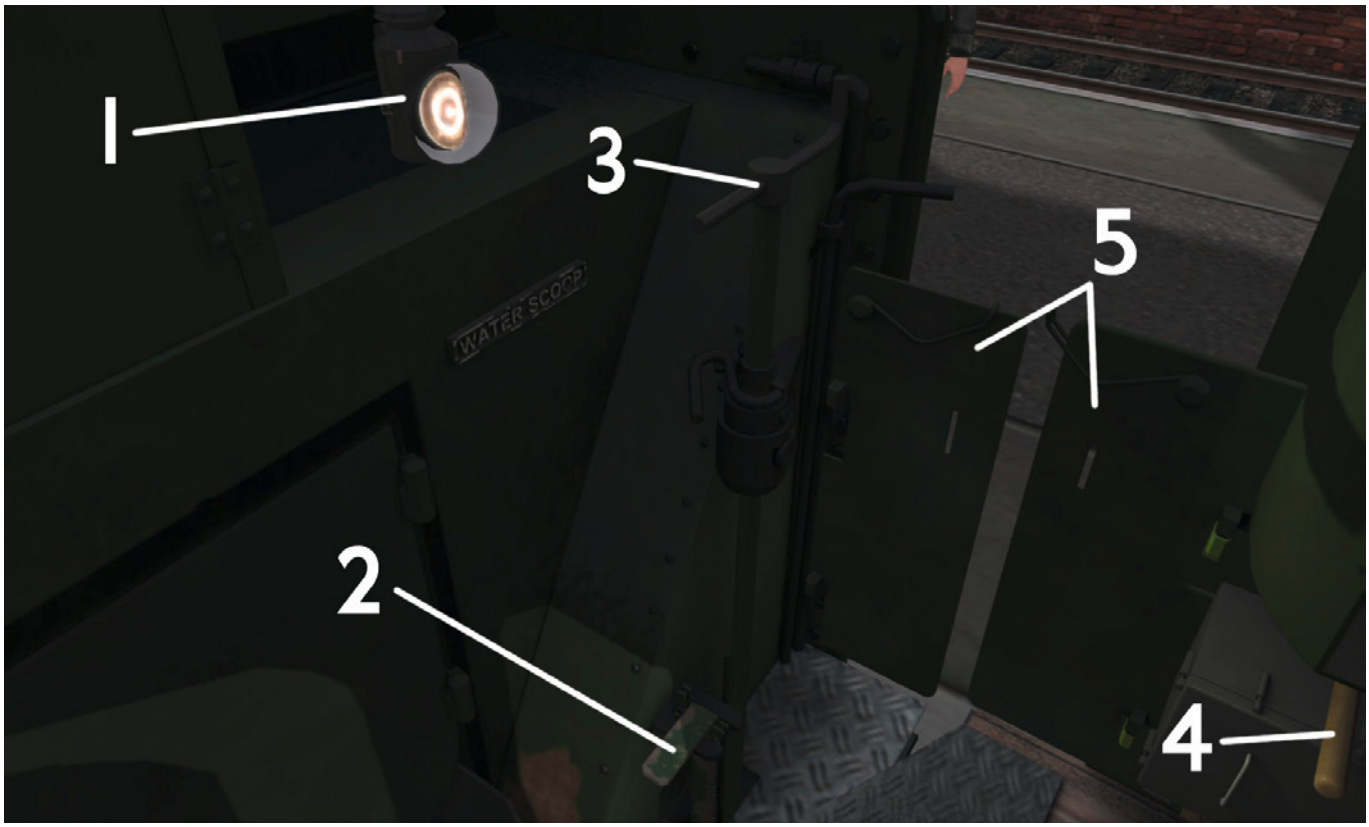
4. Tender handbrake

Use the [/] key (forward slash) to set the brake ON and OFF. We advise against using the mouse on this control as it is less accurate than using the keystroke. The brake has to be ON for all servicing to be carried out. If it will not release, either the smokebox door or the sandbox lids have not been fully closed.

5. Cab gates (fireman's side)

For the safety of the on-board crew, simple flaps with interlocking brackets provide protection against falling out of the side of the cab. Drag the locomotive flap towards you to pull both flaps open, and push it away from you to close them.

Left back



1. **Oil hand lamp**

   This will help illuminate the cab area for night operations. Click on the lamp or use [Ctrl]-[H] to turn it on/off.

2. **Tender live water feed**

   Lower this to supply water from the tender to the live injector. For the live injector, you must raise the feed lever up again after use because the live injector doesn't stop the overflow from wasting the water all over the ballast below.

3. **Tender water scoop**

   Lower the water scoop when travelling over a working water trough to replenish the tender water supply whilst on the move. Make sure you raise it back up before you reach the end of the trough!

   Note: *The water troughs featured in the Dovetail Games 'Riviera in the Fifties' route are currently the only working water troughs that we are aware of. If another route features water troughs, contact the route author or publisher to find out if they are simply cosmetic or are working.*

4. **Driver's water trimmer (live steam)**

   This valve allows water flowing from the tender to the boiler via the live injector to be adjusted to make it easier for the fireman to operate the live injector with variable boiler pressure. Turn clockwise for full flow rate.

5. **Cab gates (driver's side)**

   For the safety of the on-board crew, simple flaps with interlocking brackets are provided to protect against falling out of the side of the cab – this is quite possible on particularly bad track with the loco and tender rocking all over the place! Drag the locomotive flap towards you to pull both flaps open, and push it away from you to close them.

CAB VIEWS

Move view to various pre-set points left and right in the cab – Left and Right arrow keys.

Zoom view in and out – Up and Down arrow keys, or scroll the middle mouse wheel up and down.

Look around the cab – hold the right mouse button down and drag the mouse to move your viewpoint around the cab.

Head out of cab – press [Shift-[2] to move to the 'head out' position. Use the Up and Down arrow keys to look forward or backward when in this view. Use the Left and Right arrow keys to change sides of the cab.

Note: *An alternative option for head-out views is available as part of the in-cab view, which you can access by cycling through the cabview positions with the Left and Right arrow keys.*

HEAD-UP DISPLAY (HUD)

IMPORTANT! *When the locomotive is in Advanced mode (as it is by default) operating it via the [F4] HUD (Head-Up Display) controls can result in erratic operation and the HUD will display unrealistic readings. We strongly advise that you do NOT use the [F4] HUD with Advanced mode as it will interfere with the firing and injector scripting, and we also do not advise using the [F4] HUD with Intermediate mode if you intend to use ActivFireman – Intermediate mode is otherwise fully compatible. We recommend that you use the [F3] HUD and [F5] HUD with keyboard and mouse controls to receive more accurate information and to prevent any erratic behaviour in Advanced mode.*

The list of control key commands is provided in the KEY COMMANDS AND OTHER FEATURES section of this manual.

Here is some information about the Head-Up Display:

In Train Simulator the default control display is the HUD, which is enabled with the [F4] key on your keyboard. This shows the status of the scenario and the train, and also provides mouse-operable controls to allow you to drive the locomotive.

All the function key views and functions from previous versions of Train Simulator are still available as described, but when the HUD is selected the views controlled by the [F3] and the [F5] keys do not display. Turning OFF the HUD (with the [F4] key) will allow the [F3] and [F5] views to display.

The information and controls available via the HUD will differ depending on your current scenario, driving mode (Simple or Expert) and the type of engine that you are driving.

If you hover over a section of the HUD with your mouse you'll see a handy explanation of the feature, but for full information on the HUD and all of its features please refer to the Train Simulator manual.

To get more detailed information about the engine, turn off the HUD (using the [F4] key), press the [F5] key twice to bring up the engine information and you will see the following indications:

Speed – MPH

Regulator – position in %. In Advanced mode this shows the pressure in the steam chest as a percentage of its maximum possible at a given boiler pressure. In Intermediate and Simple modes it shows the position of the regulator handle in the cab.

Reverser – forward/reverse average cut-off, not necessarily nominal cut-off as indicated by the reverser indicator or [F3] HUD.

Train brake – 0-100% Direct will be shown, with 0% being fully released at 23" Hg and 100% being fully applied at 0" Hg.

Boiler pressure – PSI up to a maximum of 205 PSI. Aim to keep the pressure between 190 and 200 PSI under normal running conditions, especially when attacking a climb. For driving on gentle heritage railways, 175 PSI will be more than adequate in most cases.

Steam chest pressure – displayed in PSI. Note that this is not the steam chest pressure as modelled on the LNER V2 Advanced; it is part of the host software and, while called Steam Chest Pressure, is actually an indicator for the Power of the loco (force x speed).

Boiler water level – due to the host software always starting with a water level of 1.00, which is a bit high, 1.00 on the HUD is shown as 0.75 on the cab gauges, which is about the highest you would want the water on the real V2. A low water level spells disaster. Keep the water (shown as blue) well up the tubes. Don't go much above 1.00, though, as the loco may begin to 'prime'. Aim to keep the water level between 0.66 and 1.00 as much as possible. If starting and facing uphill, and the water level exceeds 1.25, then to avoid priming you MUST keep the cylinder cocks open until the water level has fallen below these critical levels.

Fire mass – displayed in pounds (lb) and referring to the 'strength' of the fire. Don't let it get too high as the coal won't burn quickly enough; you generally need to keep it at around 660 pounds if you need a really hot fire.

Steam generation rate – how much steam the boiler is creating.

Steam usage rate – how much steam the engine is using. If this is above the steam generation rate then you are using more steam than can be produced. This is usually not ideal but it can be helpful if too much steam is being produced and the safety valves keep going off. On gradients make sure that the usage rate is as close to the generation rate as possible, to take advantage of the maximum available work. When you open the injectors, more steam will be used.

Cylinder cocks – open or closed. Open to allow water out of the cylinders to prevent damage. Use them for around 10-15 seconds after standing for more than 5-10 minutes. Make sure that they are open for longer when moving off-shed. In Advanced mode the cylinder cocks are fully operational. Use them to drain any residual pressure from the steam chest after coming to a stop. If you leave the locomotive for a long period of time, condensation will build up and, if the cylinder cocks are not open, you risk blowing a large hole through the cylinder cap when you begin to move.

Brake pipe pressure – the pressure in inches of the vacuum in the brake pipe. Aim for 21 inches when the engine is moving, and at least 19 inches. The brakes start to take effect properly below 15 inches. If you are going down a steep hill it is generally a good idea to leave the brakes applied to maintain a constant speed, although to prevent overheating ensure that you give the brakes a 'breather' by releasing and re-applying them periodically.

Small ejector – open or closed. This creates the vacuum needed for the brakes to function. In Advanced and Intermediate mode be aware that it will only show as open when the large ejector is being used and NOT the actual small ejector, to simulate the increased steam usage by the large ejector.

Tender water level – displayed in gallons. You will see the level go down as the water is used. Don't run out!

Tender coal level – displayed in pounds (lb). You will see the level go down as the fire is stoked. Again, make sure you don't run out. You can usually fill up with coal at Motive Power Depots and water columns are available at many stations.

Blower – on/off. This is used to blow steam out of the chimney and thereby create a through-draught which will draw the fire through the boiler tubes. Generally this can be turned down when you begin to slow for a station and then increased prior to departure, helping to ensure that you don't 'blow off'.

Damper – on/off. The damper is a flap which regulates the flow of air through the ash pan under the firebed. In Advanced mode this shows the 'overall' damping of the fire between the front damper and the fire door. In Simple mode it shows whether the single damper control is NOT closed (off). 'On' can mean anything from 1% to 100% open.

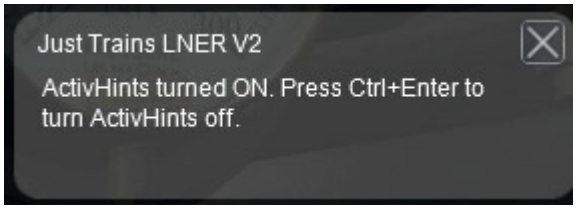
KEY COMMANDS AND OTHER FEATURES

Control	Key mapping/Action
Reverser	[W] – Decrease cut-off (Advanced mode) Increase cut-off (Intermediate mode) [S] – Increase cut-off (Advanced mode) Decrease cut-off (Intermediate mode)
Regulator handle	[A] – Increase opening [D] – Decrease opening
Vacuum brake handle	[;] – Decrease brake application ['] – Increase brake application
Handbrake	[/] – Toggle on/off
Whistle	[Spacebar] – Loop [B] – Short toot
Cylinder drain cocks	[C] – Hold to open [Shift]-[C] – Hold to close
Exhaust injector steam valve	[I] – Increase opening [Shift]-[I] – Decrease opening
Live injector steam valve	[O] – Increase opening [Shift]-[O] – Decrease opening
Tender exhaust water feed	[K] – Toggle down/up
Tender live water feed	[L] – Toggle down/up
Exhaust injector water trimmer	[Ctrl]-[K] – Increase opening [Ctrl]-[Shift]-[K] – Decrease opening

Live injector water trimmer	[Ctrl]-[L] – Increase opening [Ctrl]-[Shift]-[L] – Decrease opening
Gravity sander lever	[X] – Hold to open / Release to close
Steam sander valve	[Ctrl]-[X] – Toggle on/off
Damper wheel	[M] – Turn anti-clockwise and open [Shift]-[M] – Turn clockwise and close
Blower valve	[N] – Increase opening [Shift]-[N] – Decrease opening
Main fire flap	[F] – Open gradually [R] – Whack open with shovel
Fire flap catch	[Shift]-[F] – Lift catch to close fire flap
Stoking	[R] – Start stoking [Shift]-[R] – Stop stoking
Headlights	[H] – Cycle from no headlights to forward headlights, then backward headlights [Shift]-[H] – Cycle from backward headlights to forward headlights, then no headlights
Load fuel/passengers/freight	[T] – Begin loading
Reverser lock	[E] – Toggle lock on/off
Small ejector	[J] – Increase [Shift]-[J] – Decrease
Vacuum reservoir release	[P] – Push and hold to release
Top lamp (NUM lock ON)	[Ctrl]-[8] – Toggle to place/remove
Left lamp (NUM lock ON)	[Ctrl]-[1] – Toggle to place/remove
Middle lamp (NUM lock ON)	[Ctrl]-[2] – Toggle to place/remove
Right lamp (NUM lock ON)	[Ctrl]-[3] – Toggle to place/remove
Sandbox filling	[Ctrl]-[Shift]-[X] – Hold to fill
Steam heat	[Ctrl]-[5] – Toggle on/off
ActivHints	[Ctrl]-[Enter] or [Ctrl]-[Return] – Toggle to turn ActivHints on/off
ActivFireman	[Ctrl]-[F] – Toggle to turn ActivFireman on/off
Hand lamp	[Ctrl]-[H] – Toggle on/off
Difficulty mode (Advanced/Intermediate)	[Enter] or [Return] – Toggle between Advanced and Intermediate modes
Manual brake mode	[Page Up] – Cycle from DA (Direct Admission) valve mode to non-DA valve mode, and again to Unfitted mode. [Page Down] – Cycle from Unfitted mode to non-DA valve mode, and again to DA valve mode.

ActivHints

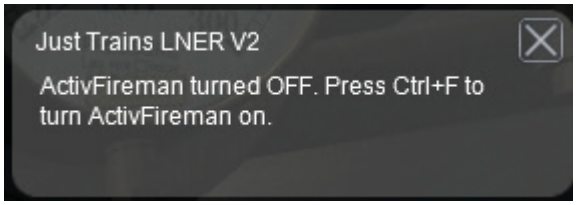
Use [Ctrl]-[Enter] or [Ctrl]-[Return] to toggle the ActivHints training system on/off at any time. ActivHints provides useful hints and tips for operating the loco and informs you where you are going wrong, how you can improve your technique and about urgent matters such as low water in the boiler. A message at the top right of the screen will show the on/off status of ActivHints. ActivHints are displayed at the top right of the screen and will continue to display periodically until the situation displayed by the ActivHint is resolved.



ActivFireman

This is the custom AI fireman built specifically for Just Trains Advanced steam locomotives; use [Ctrl]-[F] to toggle the ActivFireman feature on/off. When activated, ActivFireman will take over the firing responsibilities so that you can just enjoy the drive. ActivFireman is more intelligent than the default host simulation fireman, by knowing when you need a large fire and responding to lack of steam production or too much steam lifting the safety valves.

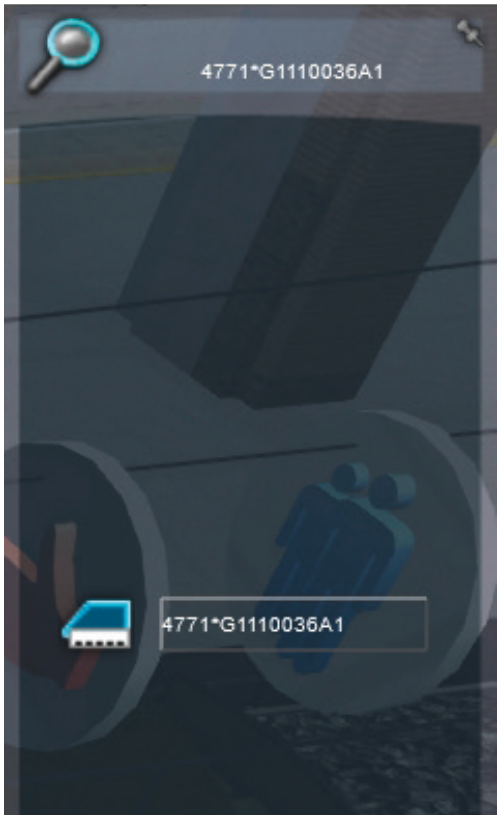
Note: *The Automatic Fireman feature in Train Simulator MUST be turned OFF in the game settings. A message at the top right of the screen will show the status of the ActivFireman.*



Pre-setting the headcode, and other options

The Just Trains LNER V2 not only has the most liveries included in a Just Trains steam loco product to date, but the number of visual details that you can select for your chosen livery is also the most comprehensive. You can pre-set the lamp headcode as well as make some other visual and operational changes via the locomotive's number set in the Scenario Editor:

1. Start your scenario.
2. Press [Ctrl]-[E] to enter the Editor.
3. Press the orange-coloured train icon in the top left fly-out menu.
4. Click 'Yes' on the next window.
5. In an external view double-mouse-click on the locomotive.
6. A fly-out menu showing the current locomotive number set will appear in the top right corner.



In an effort to cover as many of the livery and detail combinations that were seen across the V2 class as possible, whilst keeping the number of individual models and your valuable HDD space usage to a minimum, we have developed a new auto-numbering system that allows the different numbering sequences to be available on each model.

For example, the unlined black locomotive could have a shaded 4-digit LNER number, a 3-digit shaded LNER number, a 3-digit Gill Sans LNER number, an early BR E-XXX number, or a BR 60XXX number.

For the system to work correctly, it is essential that you put in your required locomotive number at the start of the string. If you wish to customise further details such as the headcode, brake mode, shed code etc. then you must add an * (asterisk) character immediately after the number, to keep the locomotive number string separate from the details selection string. We shall go into this in more detail.

The number string options are dependent on the livery chosen. The following are valid locomotive numbers, with compatible liveries in brackets:

1) **XXXX** – 4-digit number in shaded LNER font, e.g. 4771 (Doncaster Apple Green, Darlington Locomotive Green, Unlined Black).
2) **XXX** – 3-digit number, which can be further customised into shaded LNER font or unshaded Gill Sans font using the details selection string, e.g. 800 (Doncaster Apple Green, Darlington Locomotive Green, Unlined Black).
3) **EXXX** – LNER 3-digit number with an E prefix to designate a former LNE region loco on British Railways, e.g. E800 (Doncaster Apple Green, Darlington Locomotive Green, Unlined Black).
4) **XXXXX** – 5-digit BR number, e.g. 60800 (Unlined Black, BR Lined Black, BR Lined Green).

After setting the locomotive number you wish to have, you can either leave the character string at that and the remaining details will be applied randomly, or you can further customise them using the details selection string. Before typing out the details selection string, ensure that you have typed in an * (asterisk) after the locomotive number string with no spaces. Start typing out the details selection string after the * with no spaces.

The details selection string is broken down as follows:

XXXXX*ABCDEFGGGH

A – lamp headcode (0, A, B, C, D, E, F, G, H, J, K). See the 'Headcode and shed code resources' section for details on which headcodes were used for each type of train.

B – name plates present, if the locomotive is named (0 for no nameplates, 1 for nameplates).

C – works plates positions (0 for smokebox, 1 for cab side, 2 for no plates).

D – steam pipe type (0 for original, covered monobloc, 1 for exposed monobloc pipes, 2 for large steam pipes for separate cylinders).

E – brake mode preset (0 for DA valve majority stock, 1 for non-DA valve majority stock, 2 for unfitted/light engine).

F – LNER number font for 3-digit and E-number set-ups (0 for LNER font, 1 for Gill Sans unshaded font).

GGG – shed code. For single-digit shed codes, the second shed code character should be set to 'X', e.g. 1XA would give shed code 1A, otherwise the shed code can be typed out as normal, e.g. 12A would give shed code 12A. See the 'Headcode and shed code resources' section [LINK] for details on which shed codes were used for each shed.

H – warning flashes present (0 for no warning flashes, 1 for warning flashes).

The details selection string is always in the above order, so if you wish to customise any one particular feature you must include all of the preceding detail selection characters first.

For example, if you wanted to customise the shed code only (**GGG**), you must also set characters **A, B, C, D, E** and **F** first, but you do not have to also include the remaining characters, in this case H for warning flashes. The undetermined details due to remaining string characters which have been left out will be randomly selected.

You can also pre-set the logos on the sides of the tenders. This is just a simple case of changing the tender's character string to a single number to get the logos/lettering that you want. The options for each livery are listed below:

LNER Doncaster Apple Green:

- 1 – 'LNER' in shaded LNER font
- 2 – 'LNER' in Gill Sans font
- 3 – 'BRITISH RAILWAYS' in Gill Sans font

LNER Darlington Locomotive Green:

- 1 – 'LNER' in shaded LNER font
- 2 – 'LNER' in Gill Sans font
- 3 – 'BRITISH RAILWAYS' in Gill Sans font

Unlined Black:

- 1 – 'LNER' in shaded LNER font
- 2 – 'NE' in shaded LNER font
- 3 – 'LNER' in Gill Sans font
- 4 – 'BRITISH RAILWAYS' in Gill Sans font

BR Lined Black:

- 1 – 'BRITISH RAILWAYS' in Gill Sans font
- 2 – the Early Emblem with both sides showing the lion facing the front of the locomotive

- 3 – the Early Emblem with both sides showing the lion facing left
- 4 – the Late Crests

BR Lined Green:

- 1 – the Early Emblem with both sides showing the lion facing left
- 2 – the Late Crests

To make sure that we have understood the system, we'll go through an example set-up.

We are creating a scenario in which the player is driving 60862 on a Class C goods in 1962. Photographic evidence shows that 60862 was in BR Lined Green at this time, was fitted with a Kylchap exhaust system with separately cast cylinders, and warning flashes were present. The tender was a later Type 3 version. 60862 was based at New England shed 34A. The goods vehicles should be fitted but were probably not DA valve fitted. This is all the information we need to recreate 60862 in 1962:

1. Select *JT LNER V2 Kylchap Double Chimney BR Lined Green* from the drop-down menu and place it on the track.
2. Select *JT LNER V2 Tender 4200gal GS Type 3 BR Lined Green* from the drop-down menu and couple it to the rear of the locomotive.
3. After double-clicking on the locomotive to bring up the right-hand fly-out, so that we can edit the character string, we need to put in the locomotive number 60862.
4. We want to fully specify the details for this locomotive, so we need to type in an asterisk (*) with no spaces before we begin to set up the detail selection string.
5. We want the headcode to be pre-set to a Class C freight, so we type in 'C'.
6. 60862 is not a named loco so whether the nameplates are present or not is irrelevant, but we must include some character anyway, so we just put '1' to fill in the gap.
7. Photographic evidence shows no visibly obvious builder's plates on the exterior of 60862 in 1962, so we set the shed code character to '2'.
8. 60862 had separately cast cylinders in this period, so we need the larger external steam pipes instead of the older monobloc design. We set the next character to '2'.
9. Based on our assumptions about the stock and the Class C freight designation, we want the presumed lack of DA valves to be simulated on the fitted freight and so we set the brake mode to '1'.
10. We are not using an LNER Green model so whether the number is to be LNER font or Gill Sans font is unimportant, but again we must fill this gap with something, so we type '0'.
11. For the next three characters, we need to specify the shed code. New England shed was 34A, so we simply type '34A'.
12. 60862 had warning flashes present at this time so we set the last character to '1'. The tender will automatically copy the loco in this regard whilst it remains coupled.
13. Hit the Return/Enter key to save the character string on the loco, which should now be visually updated so that you can check everything is correct.
14. Double-click on the tender. The tender needs to have a Late Crest for this era, so set the tender character string to '2', and press [Return/Enter] to save it. The tender should now have a Late Crest.

After the above process, we should have a locomotive character string like this:

60862*C1221034A1

IMPORTANT! *After you have changed the locomotive numbering, press the [Return/Enter] key, otherwise your changes will NOT be saved.*

When you are ready to go back into the simulation, press the orange triangle in the lower right corner of the screen. Click 'Yes' when prompted and you will be taken back into the simulation.

Headcode and shed code resources

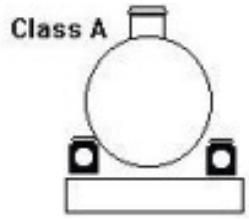
A list of British Railways shed codes can be found online:

https://en.wikipedia.org/wiki/List_of_British_Railways_shed_codes

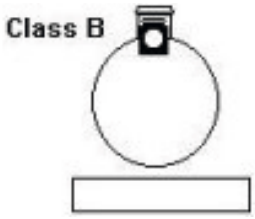
The available headcode letters that you can use when setting up the number string are:

A, B, C, D, E, F, G, H, J, K or 0 (zero) for none. Please note that Class I was not used.

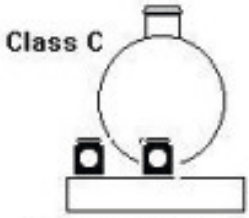
Refer to the following headcode images to find the suitable headcode for the services that your locomotives are going to work.



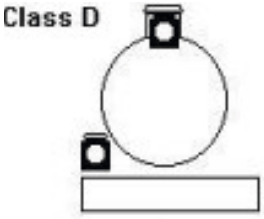
Class A – express passenger or a breakdown train or snowplough en route to a job



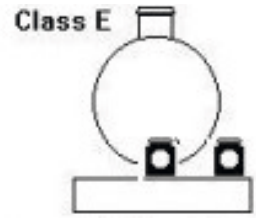
Class B – stopping passenger, rail motor or a breakdown train returning from a job



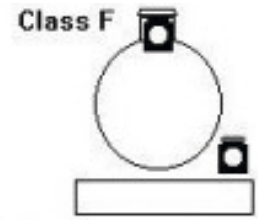
Class C – parcels, fish, livestock, milk, fruit or perishables, all XP stock



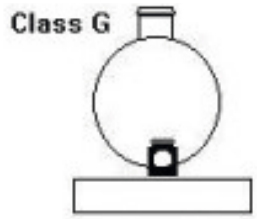
Class D – express freight or live stock with at least 30% XP connected to loco



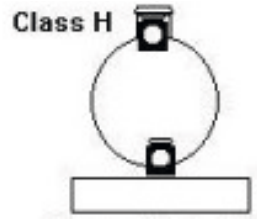
Class E – express freight with at least four fitted vehicles connected to the loco or a short unfitted express freight



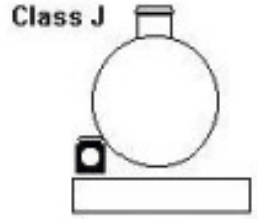
Class F – express freight all unfitted stock



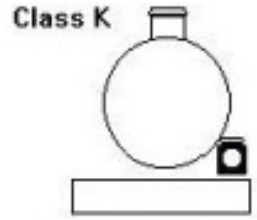
Class G – light engine or engine with one or two brake vans attached



Class H – through train or ballast train



Class J – through mineral or empty wagon train



Class K – pick-up or branch freight or mineral/ballast train on a short haul run

Headcode lamp operations

Note: *You can either pre-set the lamps/headcodes via the locomotive number in the Editor, as described above, which is very useful for scenario authors to set the headcode on non-player loco's. If that is not applicable to you, you can set the lamps/headcodes when in-sim as described below.*

Use the master light switch [H] and [Shift]-[H] to show or hide the lamps.

Even after pressing [H] initially a lamp may NOT show, but don't worry and use the number pad number keys to show/hide the different lamps:

[Ctrl]-[1] – left lamp

[Ctrl]-[2] – centre lamp

[Ctrl]-[3] – right lamp

[Ctrl]-[8] – top centre lamp

Note: *We recommend using the Numpad to control the lamp positions. The [Num Lock] key must be ON to do this. If your keyboard does not have a Numpad, then you can use the number keys instead.*

Information on using the different type of headcodes can be found here: http://www.uksteam.info/gwr/hcodes.htm

Adding a cylinder cock leak in scenarios

You can add a leaking cylinder cock by placing the supplied marker in your scenario:

1. Start your scenario.
2. Press [Ctrl]-[E] to enter the Editor.
3. Press the orange-coloured train icon in the top left fly-out menu.
4. Click 'Yes' on the next window.
5. On the middle fly-out window select the 'Track infrastructure' icon (this looks like a semaphore signal).
6. Scroll down to find and select 'JT-Trigger Point (Cylinder cock leak)'.
7. Place this between the rails at your desired location. Ensure that the arrow is facing the direction of travel. When you are happy with its location, sink the marker to be invisible below the track by using the Up/ Down arrow on the marker sphere.

8. At a location further along the track find and select from the menu the 'JT-Trigger Point (Cylinder cock leak off)' marker.

9. Place this between the rails at your desired location. Ensure the arrow is facing the direction of travel. When you are happy with its location, sink the marker to be invisible below the track by using the Up/ Down arrow on the marker sphere.
10. When you have done this, press the orange triangle on the bottom right corner of the window and save the changes.

You are now ready to run!

SUPPLEMENTARY TECHNICAL INFORMATION

Here is some supplementary information for those of you with a deeper technical interest in how a LNER V2 worked and who would like to get the most out of this Advanced locomotive simulation.

How does the regulator work?

The regulator on the V2 is a fairly typical pull-out design that can be traced back to the Great Northern Railway. Originally there was a regulator handle at each side of the cab, joined by a cross-axle that ran along the firebox backhead, although the handle on the fireman's side was often removed after accidents involving the fireman being clubbed on the head! In the middle of the cross-axle is the stuffing box which is tightly sealed to stop steam leaking out into the cab. The stuffing box contains a cam that pushes the main regulator rod further into the boiler laterally towards the dome.

By pulling the regulator handle out towards the driver, the main regulator rod is pushed into the boiler to rotate a lever below the dome, which is joined to the main steam pipe S-bend. Originally, this lever raised a valve stem that runs straight up through a special type of heavy-duty poppet valve, the Owen balancing double-beat valve. Split into two halves, with each half having a balancing cushion of steam from above and below to make it easier to move, the valve stem is lifted and pushes up the lower half off its valve seat, allowing steam into the main steam pipe to the superheater header.

Further upwards movement will increase the space between the lower half's bottom edge and seat, increasing the flow of steam into the system, while also now lifting the top half off its seat as well. Continuing to pull out the regulator handle will continue to lift up both halves together as one piece, which is why it is called a double-beat valve – it essentially becomes one piece with two valve seats and two passageways for steam, which is a method of valve balancing in itself.

A problem with the original type of regulator set-up is that the two halves of the regulator valve do not always return fully home to their valve seats, and as a consequence the regulator can be alarmingly leaky, slowly filling the steam chest while the driver might not be aware of it. This highlights the importance of returning the reverser to mid-gear, having at least the handbrake on and keeping the cylinder cocks open whenever you are standing around for any length of time.

During the Swindon Test Plant trials with No. 60845, the original regulator leaked so much that enough steam entered the steam chest whilst stationary that the locomotive managed to escape from the test plant's rolling road! In an effort to take back control, the driver put the loco into reverse to stop it running too far forwards and potentially running someone over, but this caused the locomotive to reverse back into the testing plant and smash its cab into the test station. As can be imagined, Swindon was entirely unimpressed with such a faulty and dangerous design, and sent the loco back to Doncaster to have a new, single-seat regulator installed that was much less prone to leaking steam before continuing with their experiments. This was the new standard regulator valve fitted to the remainder of the V2 fleet, and was largely the same as the Owen type in that it was a self-balancing poppet valve, but there was only one valve seat instead of one each on two loosely coupled castings.

As steam travels down the main steam pipe to the superheater header at the back of the smokebox, it is then directed into the superheater element pipes, which run backwards and forwards along the boiler's large tubes, to be superheated by the fire that gets drawn along the large tubes. The superheater element pipes return to the superheater header and are shared equally into three large steam pipes that feed the three cylinders via the steam chest.

Gresley conjugated valve gear

Unlike most locomotives, all Gresley three-cylinder loco's are equipped with two types of valve gear: Walschaerts, which is described in detail in the next section, and Gresley's patented conjugated valve gear. Gresley's conjugated valve gear was by no means the first type of conjugated valve gear to be invented, but it is probably the most famous and divisive. World-famous locomotives that use the gear include Mallard and the A4s, as well as Flying Scotsman and Green Arrow.

So what exactly is conjugated valve gear? Well, we first need to consider the problem that Gresley et al. were trying to alleviate or overcome by employing conjugated valve gear. Most steam locomotives are two-cylindered, with either two cylinder blocks directly coupled to the wheels via the connecting rods on the outside of the locomotive, or the two cylinders are squeezed in between the front of the frames and below the smokebox with all of the motion packed between the frames and running to several crank axles. Each cylinder had its own set of valve gear for controlling the valve events that admit and exhaust steam into and out of each side of the cylinder, and they were usually on the outside if the cylinders were on the outside, or they were between the frames if the cylinders were inside.

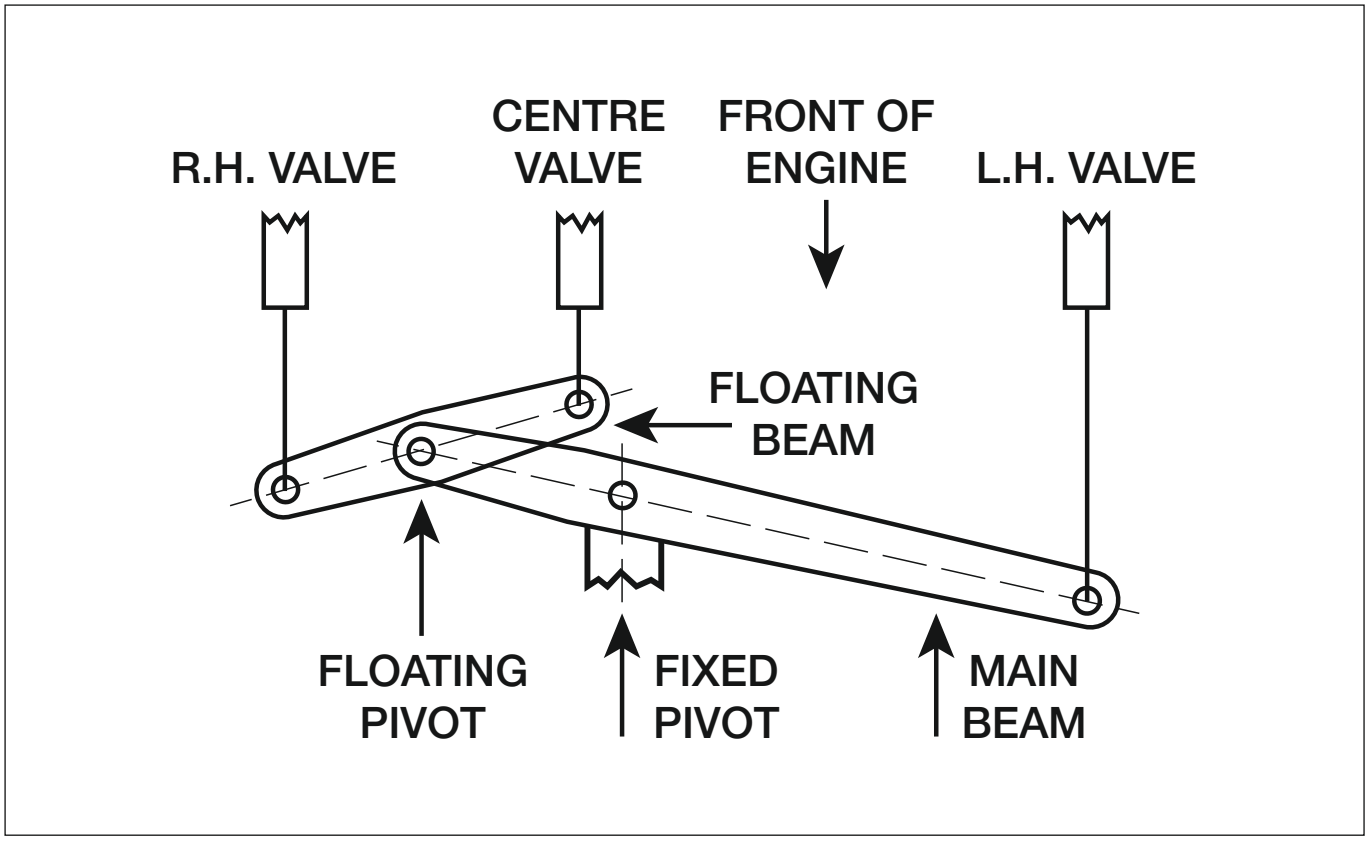
Basically, for a simple two-cylindered locomotive with either inside or outside cylinders and valve gear, there was room somewhere on the loco for each cylinder to have its own valve gear and, if access was difficult, you could have all of the motion outside and easily accessible, as on the BR Standards.

For three-cylindered loco's, your options were much more limited. Whether you wanted to implement it into your design or not, you needed to have one cylinder in the middle to drive a crank shaft in between the frames, and that meant having a third set of valve gear tucked between the frames as well. This was clearly not a massive issue as the vast majority of three-cylinder loco's did have three sets of the same type of valve gear (Walschaerts normally), but it also meant having to find a way to get the inside motion connected to the crank shaft with not a lot of wiggle room, often leading to design compromises. Furthermore, on larger loco's with huge diameter boilers, getting access to the inside motion oiling points required some uncomfortable acrobatics.

Many railway engineers and draughtsmen wanted therefore to simplify the motion arrangement, thereby increasing their options for the use of space while making the job less unpleasant for the footplate staff. Indeed, whilst not a driver himself, Gresley aimed to provide his men with more ergonomically comfortable working conditions, such as his relatively luxurious cabs that made even the more modern GWR, LMS and SR (until Gresley's right-hand man, Bulleid, took the ropes) footplate environments look basic and uncomfortable. The answer to the problem was to reduce the number of full valve gears from three to two, and derive the inside cylinder valve events from the motion of the outside gear – the conjugated valve gear, believed to have been first tried by Holcroft.

Gresley saw that, due to the harmonic motion of the reciprocating engine, he could provide motion for the middle cylinder's piston valve with just a few levers. He could see an elegant and simple mathematical solution that would not only keep the middle cylinder in time with the outer ones to produce an even six-chuff beat per revolution, but would adjust the amplitude of the inside piston valve motion to match the outer piston valves, thus the cut-off of the middle valve would match the cut-off of the outer valves. The theory was validated by a professional mathematician on Gresley's behalf, and in theory it could have worked perfectly. In reality, unfortunately, it did not.

How exactly did Gresley do it? He used two levers: a large main beam that was coupled to one of the outer piston valve stems and pivoted around a fixed point, the location of said point along the length of the main beam being fundamental to the correct operation of the entire gear. The main beam was the 'Two to One' beam, with the pivot placed two thirds of the way along the beam away from the piston valve stem end, as this provided half the displacement of the piston valve end at the other end. The other end was then joined to the middle of a free-floating small beam, which had one end coupled to the other outer piston valve and the other end coupled to the middle piston that was to be driven. The combined movement of the large and small beams driven by the outer piston valves correctly positioned the middle piston valve, or so the theory went.



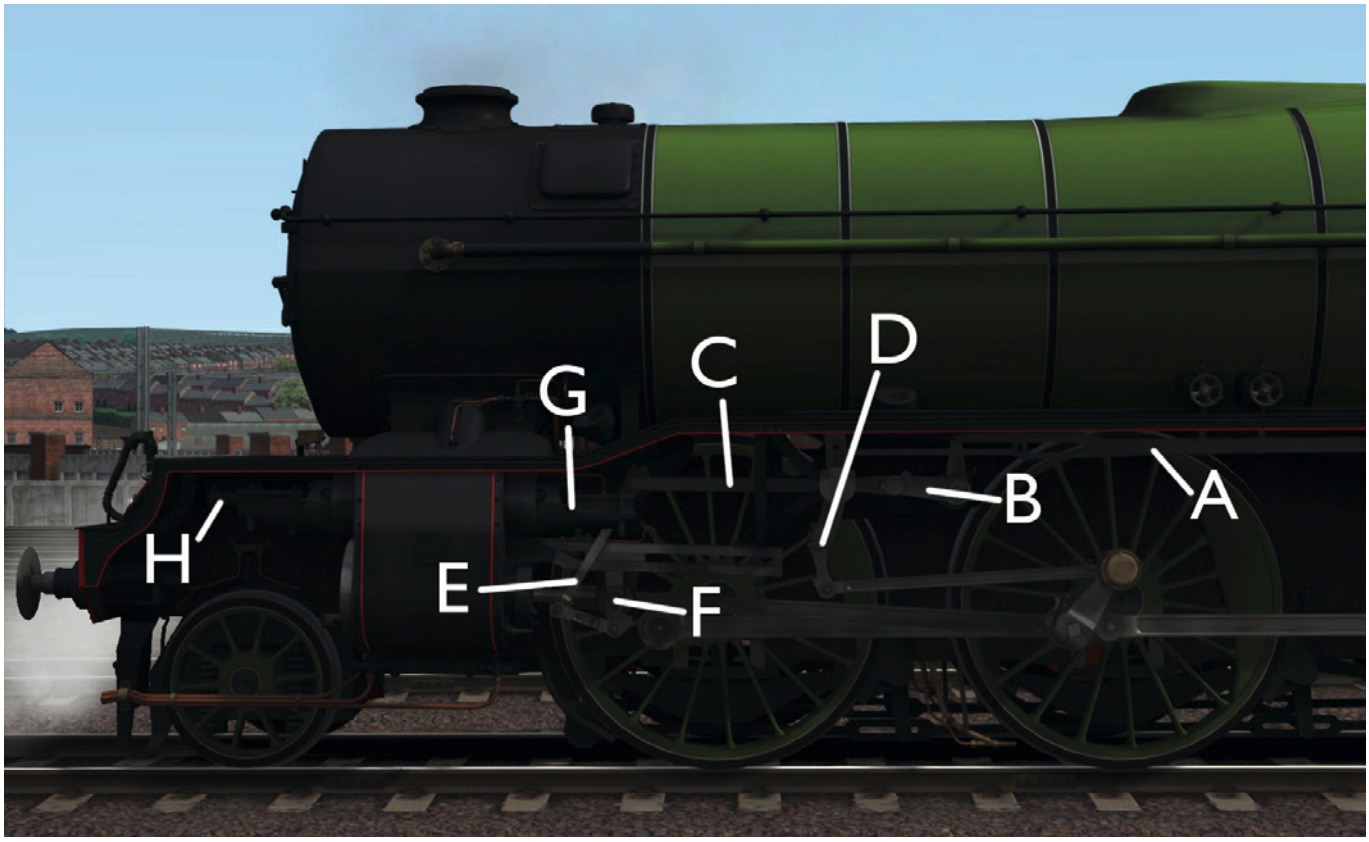
Although one of the main reasons behind the conjugated valve gear was to make a three-cylinder locomotive easier to maintain, the irony was that, to work well, the conjugated valve gear had to be set up properly with optimal beam lengths and maintained to a very high standard with very little tolerances in the joints, otherwise the movement of the middle piston valve was not so precise. Due to the inclination of the middle cylinder and piston valve, as well as friction and gravity acting on the middle piston valve, at slow speeds and short cut-offs the piston valve would usually be pushed by the gear down the slope and go too far, increasing the cut-off for the return stroke, and would not be pulled back up the slope far enough, so steam could still be exhausted but not then admitted on the downwards stroke – this is why most Gresley engines in preservation have such a characteristic chuff beat, usually missing off every sixth beat: *chuff-chuff-chuff-chuff-chuff-**blank**-chuff-chuff-chuff-chuff-chuff-**blank*.

Whereas at slower speeds the middle cylinder would effectively do half the work it was supposed to do, at higher speeds it went the other way and provided the biggest proportion of the locomotive's power. This is because as speed increased, the momentum of the large and small beams being flung around would increase and create an inertial whip effect. The beams would over-travel in both directions and the middle cylinder worked at a higher nominal tractive effort than the outer cylinders, giving Gresley three-cylinder loco's a unique 'turbo' characteristic at higher speeds when other similarly rated loco's are starting to plateau.

Despite some of his locomotives setting new world records, such as Mallard's fastest steam speed record in 1937, the war meant that the high standards of maintenance and tuning required to make the Gresley conjugated valve gear work well had declined massively, and locomotive reliability on the LNER went through the floor. After Gresley's unexpected death in 1941, he was succeeded by Edward Thompson who, like most of the other Chief Mechanical Engineers and senior engineers such as Stanier and Cox, did not share Gresley's enthusiasm for conjugated valve gear, and both he and Arthur Peppercorn continued to produce new ECML Pacifics with three independent sets of Walschaerts right up until the formation of British Rail.

What causes reverser creep?

The V2 was fitted with two sets of Walschaerts valve gear, arguably the most mathematically interesting, simple and downright beautiful of the steam locomotive valve gears. Before answering the question on reverser creep, we should discuss what valve gear is and how it works in basic terms.



The valve gear is designed to control the ‘cut-off’, the point at which the piston valves prevent the further admission of steam into the cylinders. With the V2 and its Walschaerts valve gear, this is done by using the reverser in the cab to rotate a screw inside the reverser stand, that in turn draws a long rod (A) backwards and forwards between the cab and along the top of the running plate to the lifting arm (B).

A lifting arm is rotated by the long rod levering it forwards for forward direction and back for backwards direction. Rotating this lifting arm lifts and lowers the radius rod (C) up and down the expansion link (D). This is important, as depending on where the radius rod is coupled to the expansion link, the radius rod will move to and fro in time with the rest of the motion and wheels.

At the other end of the radius rod is yet another rod, the combination lever (E), which connects to the crosshead (F) of the cylinder piston shaft, and about one eighth of the way down this combination lever is where the piston valve rod (G) is connected. The amplitude of longitudinal movement in the radius rod therefore directly changes the amplitude of piston valve movement, hence changing the cut-off.

Due to the timing of the piston valve in relation to the cylinder, forwards cut-off is when the radius rod is below the pivot point of the expansion link, and reverse cut-off is when the radius rod is above the pivot point of the expansion link. At the other side of the cylinder, the piston valve rod is connected to one of the two beams of the Gresley conjugated valve gear (H).

So, back to the original question: Why does the reverser ‘creep’? To understand this, we need to consider several forces at work. We have the weight of the lifting arm, lifting link and radius rod that obviously wants to pull these components down. We have normal forces, where the interfaces of the expansion link are pushing at the tangent of the radius rod bearing as it rocks back and forth. We also need to consider when the entire motion, including cylinder heads, piston valves, connecting rods and so on is slack or taut, depending on whether there is steam pressing against the cylinder heads and piston valve heads.

When the locomotive motion is moving and we have all of these heavy rods swinging to and fro, up and down, round and round, and back and forth, it's not inconceivable that anything that is not FIXED in place is going to move out of place, one way or another. With the radius rod, we have a combination of its weight and the normal forces acting on the bearing at the expansion link end, which causes it to slip up and down the expansion link, therefore changing the cut-off. This is why a screw reverser will oscillate sinusoidally, in time with the motion of the valve gear. When the system is slack, the situation gets even more interesting.

Due to a combination of the normal forces and gravity, this resultant force is enough to squeeze the end of the radius rod downwards along the length of the expansion link. Essentially, the valve gear forces itself into full forwards gear if left to its own devices. It takes a lot of force for the teeth of the lifting arm pinion to rotate the screw, and therefore it doesn't take too much intervening force by the driver in the cab to keep the creeping in check. But the driver is not able to keep hold of the reverser at all times, so a lock was added to hold the reverser in place.

The importance of the reverser lock should not be underestimated, as it prevents potentially disastrous reverser creep. According to the Rail Accident Investigation Branch, it was due to the reverser creeping on Southern Railway S15 '825' that the locomotive unexpectedly moved by itself from reverse gear to forwards gear, resulting in a tragic accident. Another case was when 60532 Blue Peter famously destroyed its valve gear during a horrendous slip at Durham – the resultant forces of the valve gear were strong enough to violently spin the reverser into full forward gear when the lock was unlatched. Furthermore, when a steam locomotive primes, making the regulator almost impossible to close, and then wheelslips, a technique is to reduce cut-off to stop the wheelslip, but it requires a lot of elbow to fight the reverser and wind it towards mid-gear.

Vacuum brakes

The vacuum brake on the V2 Advanced is of the Dreadnought ejector type, which was commonly used by many railway companies before the formation of BR. The small and large ejectors are part of the vacuum brake housing in the cab and are therefore very noisy! The small ejector is operated by the small ejector valve handle facing the driver, whereas the large ejector is actuated by pushing the main brake valve up past the running position into a near horizontal 'release' position.

For controlling the train brakes, your main priority is the train pipe pressure (shown on the left of the duplex brake gauge), not the reservoir pressure (shown on the right of the duplex brake gauge). This is because the brakes of a fitted train do the majority of the braking work and the reservoir pressure will only affect the locomotive's and tender's brakes. Pulling the vacuum brake handle towards you admits air into the train pipe through the holes in the air disc at the base of the main brake valve, on the left-hand side. Pushing the handle away from you to the running position isolates the train pipe from the air entering through these holes.

The reservoir vacuum pressure needs to be maintained with the small ejector to overcome leaks, and ideally it needs to be kept at 21 inches. To create the reservoir vacuum and maintain it, either the train pipe pressure must be greater than the reservoir pressure with the small ejector turned on, or the vacuum brake handle should be in the fully ON position while the small ejector is turned on – this cuts the train pipe from the small ejector whilst leaving the reservoir open to the small ejector. You may wish to destroy the reservoir vacuum in some cases, for example taking the brakes off the locomotive while they are left fully applied on the train, to enable a squeeze (compression of buffers) before uncoupling the train. To do this, ensure the train pipe pressure is at zero, turn off the small ejector and press and hold in the reservoir release valve.

The train pipe pressure and reservoir pressure control the locomotive and tender brakes directly by opposing one another on two sides of the cylinder head in the large vacuum cylinders between the locomotive and tender frames. The train pipe side is on the underside of the cylinder and the reservoir side is above. When air is admitted into the train pipe, molecules of air enter the underside of the cylinder and collide with the cylinder head, so pressure acts upwards. If the reservoir has less air molecules (higher vacuum pressure), the opposing force of pressure in the reservoir side is less than the train pipe side, so the cylinder head moves up until the two opposing sides reach a state of equilibrium. Raising the cylinder head lifts the piston stem up, which is coupled to the locomotive and tender brake rigging. By levering the rigging, the rigging moves laterally and so the brake shoes are pressed firm against the surface of the driving wheels of the locomotive and the tender wheels.

If the reservoir pressure is the same as or less than the train pipe pressure, the locomotive and tender brakes are released, because the pressure on the reservoir side is greater than on the train pipe side or equal to it AND works with gravity to push the cylinder head back down, which in turn levers the brake rigging under the frames and pulls the brake shoes away from the wheels. Furthermore, if both the train pipe and the reservoir pressure read 0 inches of mercury, or in other words are both at atmospheric pressure, the cylinder head will simply drop with gravity anyway. Therefore, to make a brake application on the locomotive and tender, it is fundamental that there is a vacuum present in the reservoir, otherwise you will be relying on the tender's handbrake, and we don't recommend that!

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Handbook for Railway Steam Locomotive Enginemen

British Transport Commission (BTC Publishing, 1957)

East Coast Pacifics at Work

P. N. Townend (Littlehampton Book Services Ltd., 1982)

DRIVING THE LNER V2 ADVANCED LOCOMOTIVE

General information

Tender water capacities: LNER group standard: 4,200 gallons

Ideal fire mass: 824lb

Ideal vacuum brake pressure when released: 21 inches Hg

Working boiler pressure: 220 PSI

Abs. max. boiler pressure: 225 PSI

Recommended maximum trailing load:

12-15 coaches on moderate/light gradients

10 coaches on steep gradients

12-25 coaches on the level

Maximum permitted speed:

90 MPH in forwards, depending on load and track conditions (LNER and BR eras)

75 MPH in forwards (preserved 60800 BR Lined Green and 4771 Doncaster Green 2000s)

60 MPH in forwards (preserved 4771 Doncaster Green)

45 MPH tender first

Prior to starting a journey

1. If running at night, click on the oil lamp placed on the tender to turn it on and help illuminate the cab area.
2. Ensure that the handbrake is released.
3. Check that the boiler is not overfilled with water.
4. Turn on (open) the cylinder drain cocks if you have not already done so.

Moving off

1. Move the train brake up to the RUNNING position, where there is a notch that resists further movement to RELEASE.
2. Normally you should move the reverser to full forward (or full reverse if travelling tender first) (65% cut-off). In adverse weather conditions, however, it might be better to start off at around 50% cut-off to reduce the chance of slipping. Consider applying some sand, especially if trying to start on a steep hill with a heavy train.

   Note: As in real life, the reverser operates in the REVERSE direction from other locomotives. To move forward you need to wind the reverser BACKWARDS towards the tender and to move the locomotive in the reverse direction you must wind the reverser FORWARDS towards the front of the loco!
3. Turn ON the small ejector slightly (with the [J] key or by using the mouse) so that the vacuum brakes begin to ease off. Leave the small ejector in this position to hold the brakes off until you next stop. To release the brakes more quickly you can push the brake handle up past the running position to the RELEASE position, which engages the large ejector, but move it back to RUNNING once the brakes are released. Check the brakes are off by verifying that there is a reading of at least 19” on the left side of the brake gauge.
4. Open the regulator to about 10-20% of its full travel (press [A] or drag with the mouse carefully) to allow steam into the steam chest. Allow the cylinders time to drain water while making a steady departure.
5. After a couple of wheel turns, close the cylinder drain cocks. If there is any water squirting out of the cylinder cock drain pipes next to the front bogie wheels there is still water in the cylinders, so open the drain cocks again and let them flush for a short time while you start to gain momentum.
6. In most circumstances you can now notch the reverser up to 45% cut-off and continue to wind it up gradually as you gather speed. If you are confident that the locomotive isn’t going to slip violently, open the regulator fully and drive the loco by carefully adjusting the reverser setting to maximise power and efficiency – you should get up to line speed in no time. Good luck and have fun!

Dealing with wheelslip

The V2 Advanced uses scripting to simulate and animate wheelslip, instead of the core simulation used by the host game. The scripting uses various factors to affect the adhesion model, such as random fluctuations in friction coefficient, weather and precipitation, and season. The purpose of this is to get around the shortcomings and temperamental nature of the core simulation and to provide a much more realistic experience for the driver, while correctly animating the wheels. Wheels will always spin when slipping, and they will always lock when skidding. The wheels will also rotate in the opposite direction of travel if the reverser is moved from one side of mid-gear to the other, i.e. from forwards (0-65%) to reverse (-65-0%) whilst moving forwards.

So what should be done when the locomotive starts to wheelslip? Firstly, you should learn to listen out for the cues that occur during slip – is the exhaust beat accelerating faster than the train? The chuff sounds and exhaust smoke are always linked to the wheel speed so watch and listen out for the cues.

When the locomotive does slip, you should shut the regulator immediately and wait for the wheels to return to the actual speed of the train before opening the regulator again for another go. For steel-steel contact, the coefficient of friction in kinetic friction (when the wheels are moving at a faster relative speed than the rails and are hence sliding over the rails) is significantly less than the coefficient of friction in static friction or ‘stiction’. In other words, once the wheels have started to slip, it takes less force for the wheels to continue to slip than it took to start the slip in the first place.

If wheelslip is persistent, you can try two things to stop it from consistently happening. You can try winding the reverser down to reduce the cut-off, which will reduce the tractive effort, but this may provide insufficient tractive effort for maintaining momentum. The other option is to apply the sanders, which will significantly improve adhesion, but the downside of this is that you can't use the sanders forever without stopping to refill the sandboxes.

Remember to only apply sand when the wheels are not slipping – applying the sanders during a slip is asking for the motion to bend out of use from the sudden force during the gain in traction.

What to do if the driving wheels lock up

You should not allow the wheels to slide along the rails for prolonged periods of time as this would cause wheel flats in the tyres and, more importantly, reduce the effectiveness of the locomotive brakes in the same way as a car skidding in the snow, so you need to ease off the locomotive and tender brakes. Remember that the loco and tender vacuum brakes are controlled by the difference in vacuum pressure between the vacuum train pipe and the vacuum reservoir.

You could simply release the vacuum brakes again to stop the wheels from skidding, but this can take quite a long time when ideally we want to stop the skidding as soon as possible. You also probably don't want to release the entire train's brakes. We therefore use the reservoir release valve, a brass button behind the vacuum brake handle. Pushing this in will let air into the vacuum reservoir, and the difference in vacuum pressure between the train pipe and reservoir reduces to zero, releasing the vacuum brakes on the locomotive and tender while keeping the brakes on the rest of the train applied. To compensate for the complete loss in loco and tender brakes, you can apply the train brakes a little more, which will make the train's brakes act harder whilst only gently applying the loco and tender brake.

Stopping the train

1. Close the regulator enough that there is little to no steam pressure in the steam chest and ensure that the reverser handle is set to no more than ±25%.
2. Apply the brakes and keep an eye on the brake gauge; the closer the needle on the left side is to 0 inches Hg, the harder the braking force. To control the pressure you need to adjust the brake valve and use the small ejector to set the brakes to the desired pressure reading. Most trains should be stopped with the gauge reading no less than 10 inches Hg otherwise it can be a rather uncomfortable stop for the passengers. Nobody likes their cup of tea spilt!
3. Once at a stand, if you are staying long, dump the vacuum or air by fully applying the brakes. Turn off the small ejector, wind the reverser into neutral gear (0%), open the cylinder cocks and apply the tender handbrake. If you are only stopping for a few minutes, apply the tender handbrake, partially release the train brakes, put the reverser into position and get ready for the off.

Recommended reverser settings

These settings are only a rough guide and very much depend on the load, fire condition and route:

0-5 MPH	65 cut-off
5-15 MPH	45 cut-off
15-40 MPH	35 cut-off
40-60 MPH	20-25 cut-off
60+ MPH	15-20 cut-off

With practice you will get a good idea of what kind of reverser setting is required in any situation. If performance is sluggish but the safety valves will not shut up, try increasing the cut-off in the direction of travel to use that excess steam and increase your acceleration. If boiler pressure is plummeting and the loco keeps hitting a constant speed, then you need to reduce cut-off to reduce back pressure and use your steam more economically.

Filling the boiler with water

1. Turn on the chosen tender water feed by pressing [K] (exhaust) or [L] (live) to toggle on/off or by dragging the water feeds with the mouse.
2. Turn on the respective injector steam valve by holding [I] (exhaust) or [O] (live), or by dragging with the mouse, until the injector starts to sing. If there is a loud roar then the injector is blowing back, in which case reduce the amount the steam valve is open. Alternatively, adjust the water trimmer to change the water flow rate as it might be too late, by using [Ctrl]-[K] (exhaust) and [Ctrl]-[L] (live) to increase, and [Ctrl]-[Shift]-[K] (exhaust) and [Ctrl]-[Shift]-[L] (live) to decrease flow rate, or by dragging the valves left to increase flow rate and right to decrease flow rate.
3. When the boiler water level reaches the desired amount (look in the water level sight glasses) shut off the injector steam valve by holding [Shift]-[I] (exhaust) or [Shift]-[O] (live) or by dragging the valve with the mouse.
4. Remember to turn off the water feed by pressing [Shift]-[K] (exhaust) or [Shift]-[L] (live) so as to not waste water by spilling it all over the ballast.

   Note: *Aim to keep your water level between half and three-quarters full. If your boiler steam pressure is not as high as you would like it, using the exhaust injector is recommended.*

   IMPORTANT! *Remember that, unlike most steam locomotives in Train Simulator, the V2 Advanced has dynamic water gauges and readings (both in the [F5] fly-out and in the cab). These readings are affected by gradients and braking/acceleration.*

   When descending a gradient of 1 in 100 or more you must ensure that the water level doesn't go above 1.00, as any ease in the gradient at this point would result in considerable damage (priming) to the loco.

   When ascending a gradient you must ensure that the water level remains above 0.35, as any ease in the gradient would mean the loco could quite easily drop a fusible plug (plugs in the firebox that melt if exposed to overheating and aim to drown the fire with steam and hot water from the boiler), instantly ending your journey. When you are braking hard the water gauge will empty completely, so you must take note of how much water you have before you begin to brake.

Priming

If you should happen to overfill the boiler at any time you will experience problems, namely 'priming'. This dramatically affects the loco's performance and can cause permanent damage, resulting in reduced power for the remainder of your journey or, in a worst case scenario, the explosion of a cylinder.

You will know the loco is priming if:

- The water level in the glass is completely out of sight and the smoke has turned white and fluffy, regardless of the regulator setting.
- The loco is struggling to steam.
- Water emanates from the chimney/cylinders.
- A cylinder blows up!

How to stop the loco priming

If you heavily overfill the boiler or are stood at a station you will need to be patient. As soon as you know that the loco is priming, open the cylinder cocks and shut the regulator, which may need slamming shut if the water carry-over is jamming the regulator. This will clear the cylinders while the loco is moving.

Open the regulator gently now without any sudden movements as a sudden drop in pressure at the dome will cause the local water surface to rise up and make the priming worse. You also want to limit the amount of water entering the internal steam system. Only when you can see the water bobbing in the gauge glasses again should you shut the cylinder cocks.

Providing steam heat

The V2 Advanced, Just Trains Mk.1 coaches and MatrixTrains Gresley Teaks are all equipped with steam heat for realistic winter operation. On a winter's day you may wish to provide heat to your passengers. To do so, simply turn on the steam heat with the handle provided and watch the gauge rise towards 100 PSI; you should then notice steam rising from the pipes between the coaches.

SCENARIOS

All the supplied scenarios are fully compatible with Advanced, Intermediate and Simple modes.

Please note that not all the following routes are included in Train Simulator by default and are not supplied with this software. You can purchase them either from the Just Trains website or from the STEAM store.

Routes followed by '**Steam**' in brackets can be purchased from the STEAM website:

- Weardale & Teesdale Network Route Add-On

Note: *At least one of the scenarios requires the Train Simulator: European Loco & Asset Pack for some of the rolling stock used. You can purchase this pack from the STEAM store.*

Standard scenarios

The total duration of these scenarios is approximately 19 hours.

Weardale & Teesdale Network Route Add-On (Steam)

JT V2 – Fast Fitted Freight

Duration: 60 minutes

Drive a V2 on an express freight from Durham to Darlington on a cold afternoon in December 1963. Whatever the weather, these important trains still have to make their vital deliveries!

JT V2 – King Coal

Duration: 60 minutes

Make an early morning light engine move from West Auckland to North Beechburn Colliery before hauling a heavy rake of coal wagons back to Shildon.

JT V2 – Picking up the Goods

Duration: 75 minutes

Work from Darlington to Bishop Auckland with a pick-up freight, collecting wagons as you progress on your journey. Prove just how versatile a V2 really is!

JT V2 – Progress, what progress?

Duration: 80 minutes

A Type 2 has failed at Wolsingham with a train for Newcastle. Work light engine from Bishop Auckland to collect it and haul the ensemble to Durham.

JT V2 – Rambling Railtour

Duration: 80 minutes

Haul a 13-coach railtour from Durham to Darlington,via Barnard Castle and a run round manoeuvre.

JT V2 – The Elizabethan

Duration: 50 minutes

Drive a V2, covering for an A4 on The Elizabethan from Darlington to Durham, diverted via Bishop Auckland due to engineering works on the East Coast Mainline.

QUICK DRIVE

This locomotive is Quick Drive enabled.

To access this option from the Main Menu press the ‘Drive’ button and then the ‘Quick Drive’ tab at the top left.

The Quick Drive menu

The area in which you select the train you wish to drive is in the top left area on the menu. You will find it in the menu under ‘LS LNER “V2” Class 2-6-0’.

When clicked on, the menu directly to the right of the train picture shows the variations/consists available for the selected train displays in the right side area of the menu. Click on the consist that you want to drive.

Selecting the route you wish to drive

When you have selected the train and consist you wish to drive, you then need to select the route.

In the middle left area are the route selection menus. Click on the middle far left route picture. This will change the right side area of the menu to display the routes that you have installed in Train Simulator.

Choosing departure and arrival stations

Click on the route ‘map’ picture directly to the right of the route picture. This will then show the available departure and arrival points for the route. You can select them by clicking on the ones you require.

Changing the time of day and weather

On the lower left area of the window are the controls for selecting these parameters. Click and set them as you desire.

Driving

When you have made all your selections, press the ‘Drive’ button on the lower right side of the menu and Train Simulator will load your settings.

ADDING THE LNER V2 ADVANCED TO YOUR OWN SCENARIOS

By default the LNER V2 Advanced is only available via the supplied scenarios, but you can make it available for other routes in the following way:

Adding the locomotive

Start Train Simulator.

From the Main Menu click ‘Build’.

Click on the ‘Scenario’ tab at the top.

Click on the route on which you want to use the V2 Advanced.

Click on ‘Free Roam’.

Click on ‘New Scenario’.

Select the location where you want the scenario to start from in the ‘Set location’ menu.

Select the type of scenario you want from the ‘Select Scenario Type’ menu.

Set the name for the scenario you want in the ‘Name’ box.

Click ‘Create’. The simulator will start to load.

When the simulation has loaded, ensure the padlock symbol is unlocked in the bottom right of the window.

Move to the top left menu (partly hidden in the border). It will slide out. Click on the pin image to lock it out, then move your mouse down to slide out the next partly hidden menu. Again, lock it with the pin.

On the lower, middle left menu, select the blue square with the orange triangle on it (Object Set filter) and a new menu will slide out to the top right of your screen. Once more, pin it to the screen.

Select ‘Just Trains’ from the drop-down list and ensure that ‘LNER_V2’ has been ticked in the middle box.

Once this has been done, click on the blue ‘Engines and tenders’ icon (this looks like a side-on view of the nose of an HST125) in the middle left menu and scroll down until you see the ‘JT LNER V2 XXX’ entries – these are the locomotives from this V2 Advanced collection.

Select one of these and then click on the area of track in the main window where you want the locomotive to be placed. When you have the right location, left-click, then right-click to deselect it.

You can change the direction it is facing by clicking on it until a large orange arrow appears above it and then clicking on the arrow to change direction.

Adding the tender

To add the tender, perform the same steps above for adding an engine but look for the entry that says 'JT LNER V2 Tender XXX' and place it up against the rear of the engine. Ensure that the tender is located with the correct orientation to the engine and that you place it right behind the engine.

For the LNER and BR era versions, you will find two types of tender in each livery, Type 2 and Type 3. The Type 2 tender was an earlier version of the LNER Group Standard 4,200 gallon tender and is represented in preservation by Green Arrow's tender. The Type 3 tender was a later improvement which brought the front coal plate further forward and raised the profile of the front coal plate for better weather protection on the footplate.

For the preservation era versions, you will find just one tender for each version of 4771/60800.

To remove the locomotive or its tender, click it so it goes red and then press the [Delete] button on your keyboard.

Adding the driver

You will need to add a driver to the engine so you can drive it. To do this, click on the engine, click on the face with a cap icon on the top left slide-out menu, then click on the engine once more. A white icon with a blue driver image will appear above the engine. Double-click on this icon and a slide-out menu will appear in the top right corner of the screen. Enter a name in the top box, and in the lower drop-down box choose a train type destined for the locomotive you have placed. For simple Free Roams this is set to 'Special' by default and can be left alone.

Adding carriages

If you want to add some Just Trains Mk.1 passenger carriages, select the red 'Rolling Stock' icon (this looks like a container wagon) on the middle left-hand slide-out menu, then select the blue square with the orange triangle on it (Object Set filter) and go back to the top right menu. In the drop-down list, select 'JustTrains', and tick the 'Mark1 coach' entry below.

Move back to the middle left menu, select the red 'Rolling Stock' icon and then scroll down until you see the relevant entries, i.e. 'JT – Mark 1'. Place these behind the tender in the same way you added the engine and tender.

To add some MatrixTrains Gresley Teak passenger carriages as well as, or instead of, the Mk.1s, again select the red 'Rolling Stock' icon on the middle left-hand slide-out menu and click on the Object Set filter square icon. This time select 'GordonMack' from the drop-down list and tick the 'LNER-TeakCorr' entry.

Back to the middle left menu, ensuring that the 'Rolling Stock' tab is still open, scroll down until you see the 'MT JT Gresley Teak' entries, and place these onto the track as desired.

Just about all UK-outline rolling stock available from Just Trains and STEAM, or from independent third parties such as Digital Traction and MatrixTrains, is compatible with the LNER V2. If you are unsure as to whether a piece of rolling stock has compatible couplings or not, go to the Train Simulator Gameplay settings and ensure that the coupling override box is ticked.

When you have finished all this, click on the bottom right large orange arrow (Drive) and click 'Yes' to save your changes.

When the screen reloads, click on the LNER V2 Advanced locomotive and you will now be the driver of the engine.

IMPORTANT! *If you have manually added any LNER V2 Advanced engines or tenders to any scenario that was not supplied with this LNER V2 Advanced package, be sure to go back into that scenario and delete them and save the scenario BEFORE you uninstall the LNER V2 Advanced package. Failure to do this will prevent the custom/personal scenario from operating. If you forget to do this and try to run a scenario you will see a Missing Stock message listing any items included with the LNER V2 Advanced package; press the [F2] key to force the scenario to forget them.*

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LNER V2 Advanced locomotive and tenders

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LNER Gresley Teak coaches

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Special thanks

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National Railway Museum

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SOFTWARE PIRACY

At Just Trains we invest significant time, effort and money in developing and publishing all our rail simulation products. This includes rewarding the programmers and artists whose creativity contributes so much to the products we all enjoy.

A pirate, otherwise known as a thief, makes a profit from the sale of other people's hard work. In some cases he makes more profit than the publishers and developers themselves make from the sale of an original title. Piracy is not just the domain of the casual domestic user, but is also a multi-million-pound business conducted by criminals, often with associations with the illegal drugs trade. Buying or downloading pirated copies of programs directly support these illegal operations.

Don't be fooled by a load of old tosh about file 'sharing'. The sites that host these 'shared' files cover their backsides with the excuse that they are simply a 'gateway' to the files. In fact, they actively encourage piracy and are often funded by advertising. Most of them are illegal money-laundering operations by another name.

The people who really suffer from game piracy are the artists, programmers and other committed game development staff. Piracy and theft directly affects people and their families. Loss of revenue to the games industry through piracy means many are losing their jobs due to cutbacks that have to be made to ensure developers and publishers survive. The logical outcome of this is that eventually the supply of rail simulation programs will dry up because developers think it is not worth the hassle.

It's not just copying software that is against the law. Owning copied software also constitutes a criminal offence; so anyone buying or downloading from these people is also at risk of arrest and prosecution.

The Spirit of Train Simulation

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